EL and P

MARCH 1, 1960

NEWS IN PERSPECTIVE

MANAGEMENT VIEW

MORE TO KEEP GROWING--Recently announced construction plans of electric power companies (supplementing a summary in EL&P, January 15, page 93) include: Over next five-year period, Detroit Edison expects to spend more than $250-million, Arizona P. S. Co. more than $262-million, The Southern Co. systems budgeting more than a half-billion dollars over a 3-year period; and Florida P. & L.--$81-million, Boston Edison--$34-million, Carolina P. & L.--$28.3-million, Central Illinois Light Co.--17-million, Potomac Edison--$8.5-million, Canadian Utilities (Edmonton, Alberta) --$3-million.

MANAGEMENT CLIMATE "FAVORABLE" to automatic control is now making it easier to win approval for programs once difficult to justify, Minneapolis-Honeywell's George M. Muschamp declared recently, while his company revealed it has an order backlog of over $35-million its #800 data processing system.(Leeds & Northrup is installing the first model of an all-transistorized unit for a P. S. Electric & Gas power station, describing it as half the size of most units in use now.) And, EEI's Pres. King says the field of automation is a two-way opportunity for electric utilities--see page 43.

PG&E A-PLANT PROGRAM includes detailed construction plans for three more nuclear plants in addition to two already operating, Pres. Sutherland revealed recently to N. Y. Herald Tribune's Donald I. Rogers. He also heard of "numerous other giant-sized projects from the dynamic president," the financial editor reports. (And, PG&E's big story splashed across 10 full-color pages of LIFE in the Feb. 1 issue.)

"BEST-MANAGED" BUSINESSES, cited by the American Institute of Management for 1959, include 35 electric and gas companies among the total of 517 American and Canadian companies recognized on basis of an annual comparative study.

"ILLEGAL" ACCOUNTING PRACTICES charged by the FPC to a number of electric utilities (Atlantic City Electric, Carolina P. & L., N. Y. State Electric & Gas, Virginia Electric Power Co., etc.) will probably be refuted largely on the basis of the course of action adopted early last month by the NARUC. Requesting extensions, some of the defendants will answer the FPC orders early this month. Meanwhile, Carolina P. & L.'s Pres. Louis V. Sutton has declared his company will resist the FPC position on this basis: "We believe the state commissions have full jurisdiction . . . and what we have done has been in compliance with orders of the commissions of North and South Carolina."

ONLY ONE PR HEAD in the Philadelphia Electric Co.--the president of this company. That's the belief of the man in charge of the utility's coordinated program for personnel, public, customer and investor relations. V-P George Conover declared in a company profile distributed in the latest issue of the EEI Customer Relations committee newsletter: "It is impossible for him (R. G. Rincliffe) personally to implement all of the necessary activities and details to bring about friendly relations with all groups and have the company recognized as a good citizen. So, the details of this task, through the coordination and cooperation of all other departments, are centrally located."

CUSTOMER EDUCATION will be facilitated by approaches like these: (1) Through distribution of TV spot commercials (prepared by ECAP), confused customers are to learn that "people--not state or city governments" own the local utility; and (2) through a new advertising program, the Florida Power Corp. is showing how the company and the industry have kept electricity costs down in spite of inflation--after a "blackout" of many years during which the utility avoided mention of rates in such promotion.

ECONOMIC CLIMATE

GOOD BUSINESS is still the rule, with odds favoring continuation of growth for the rest of the year. The National Association of Purchasing Agents notes that only 25-percent of firms with members reporting expect to reduce this year's capital expenditures below 1959--but a solid 41-percent expect to increase them. Production shows a rising trend in the NAPA survey, with more firms raising their production targets while fewer lower them. New orders show a marked increase, accompanied by growing employment.

FOREIGN COMPETITION worries the purchasing agents, even though many believe that the availability of items from abroad holds down prices in the U. S. But NAPA comments that "some of our members are asking how long they can continue to disregard better prices on foreign goods so as to 'buy American.' "

INVENTORY POLICY is a key to the future course of business. NAPA says that "most buyers are working toward keeping inventories at a minimum." Stocks are on the increase, but they are low in relation to sales volume for most industries. Since sales seem to be rising faster than inventories accumulate, there is some pressure to build up stocks. It seems clear that too fast a growth in inventories might create an erroneous impression of tight supply. The First National City Bank of New York notes that "whether accumulation is crammed into the first part of 1960 or cautiously stretched out over a longer period can spell the difference between boom and bust or a sustainable expansion." (See report on NAPA Public Utility Buyers' Group conference, pages 47-51.)

WASHINGTON INFLUENCE

COMPETITIVE A-POWER OUTLOOK, according to AEC's 1959 annual report, is not brilliant, but it is hopeful. (See Nuclear, page 45.) In 18 civilian power reactors now under construction or development, Industry has invested $465-million and the Government,$252-million. Of the 93 projects in the total program (including Defense projects), AEC will be spending 40.4-percent and private utilities and industry together will spend 25.8-percent, or $439.6-million of the total $1,702.7-million. (These include only R&D costs allocated to specific projects, but not the dollar value of waiver of fuel and material use charge.)

IN AEC TESTIMONY before annual 202 hearings, "future plans" for reactor construction revealed: an estimate that the designs of 100-megawatt prototypes of nuclear superheat boiling water and sodium-cooled fast reactors might be initiated by 1963 or '64 . . . with construction of other prototypes of current reactor concepts expected to be undertaken in the mid-60's or later. In a few years, says the AEC, a point may be reached where experiments may be justified on 3-5 of some 9-10 new ideas for major improvements in existing reactor types.

THE SENATOR FROM BOSTON, John F. Kennedy, blames the present Administration--that of a Kansas and a Californian --for causing a "depression in the handling of our natural resources." He credited Easterners--the two Roosevelts --with recognition of the West's potential. Kennedy advocated "planning for all the needs of an entire basin" and called the policy of no new starts "one of the most shortsighted and destructive policies in the history of our natural resources." Reclamation and power policies for the last eight years, he claimed, have been of "little vision and less action."

HURRICANE AND STORM RESEARCH will not be stepped up this year. House Appropriations Committee refused the President's request and cut the Weather Bureau's budget by 16-percent.

MOUNTAIN SHEEP HEARING before FPC in March is welcomed by Pacific Northwest Power Co., license applicant for the 690-foot-high dam multipurpose project. Kinsey M. Robinson, PNP's chairman, said the area "cannot afford delay." (See "Washington Outlook," page 46.)

BONNEVILLE INTERTIE REPORT has been called "myopic planning" by Gov. Brown of California. He told Congress that the State was ordering a private firm to make a study for a "truly adequate extra high voltage transmission interconnection" between BPA and the Central Valley systems. Sen. Kuchel (R., Calif.) concurred with the Governor's plans and suggested that the Interior Department also make such a study.

QUODDY DEVELOPMENT "would bring to New England the same benefits that have accrued to the Southeastern States through the development of TVA," says Rep. Oliver (D., Maine). He warned colleagues: "If the U. S. is to continue to pace Soviet efforts . . . U. S. power potential must be harnessed to its ultimate."

INDUSTRY SIFTINGS

INDICTED EQUIPMENT FIRMS, charged by the Justice Department with anti-trust law violations in February, faced further proceedings in the "continuing grand jury investigation into all phases of the heavy electrical equipment industry." Of 13 manufacturers accused, only "the big three" responded with immediate public statements—all denouncing the practices alleged as contrary to company policies. (See p. 76.)

COMPACT CAR TEST by Commonwealth Edison--now involving careful recorded operation of 128 of the utility's 1200-car fleet--may lead to an almost complete changeover to small cars by 1964. Bulk of business will go to best-performing among the Corvair, Falcon, Lark, Rambler-American and Valiant, with savings estimated to be about $100 a year.

USED ATOMIC FUEL PROCESSING, considered one of the tougher unsolved problems in nuclear power, is now being studied in an AEC-supported project by five utilities and W. R. Grace & Co.'s Davison chemical division. Feasibility of private plant operation is to be decided on the basis of the survey, to which ConEdison, Detroit Edison, Commonwealth Edison, Northern States Power and Yankee Atomic Electric Co. are contributing.

FOUR-PERCENT EFFICIENCY HIKE is the goal for which American Electric Power Co. and GE are aiming with the combination cycle project planned for the Ohio Power system. For the first time, according to AEPC, a coal-burning steam turbine (215,000-kw) is to be operated adjacent to a 5,000-kw gas turbine to produce electricity--more efficiently.

STATE COMMISSION JURISDICTION, as described in a 1954 booklet of the FPC, should be reflected in a revision of the booklet that would incorporate recent changes in various state laws, the NARUC has resolved.

RELOCATION COSTS to utilities incidental to the construction of interstate and defense highways can be paid by the following states: Illinois, Iowa, Maine, Minnesota, New Hampshire, and Texas. Enabling legislation for this purpose has been held invalid in: Idaho, New Mexico and Tennessee, while court tests are pending in Utah, Montana and North Dakota, the NARUC reports.

MEDALLION HOME AWARD record with which So. California Edison led the nation in 1958 was bettered by 331-percent last year, T. M. McDaniel reports.

EMPLOYEE COMMUNICATIONS program and techniques and materials are being solicited by a newly established subcommittee of EEI's industrial relations committee. Under chairmanship of Detroit Edison's V-P S. F. Leahy, the group will study, digest and report on the activities brought to its attention.

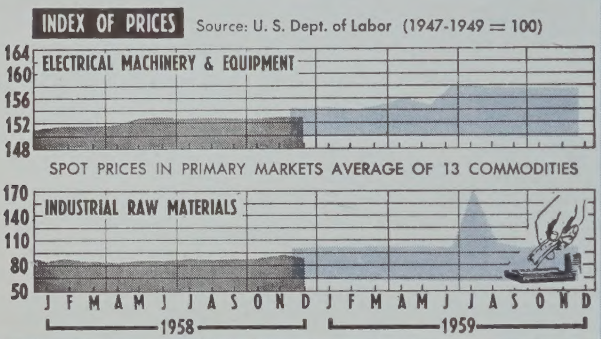
LOOKING AHEAD... FINANCIALLY

—From Irving Trust

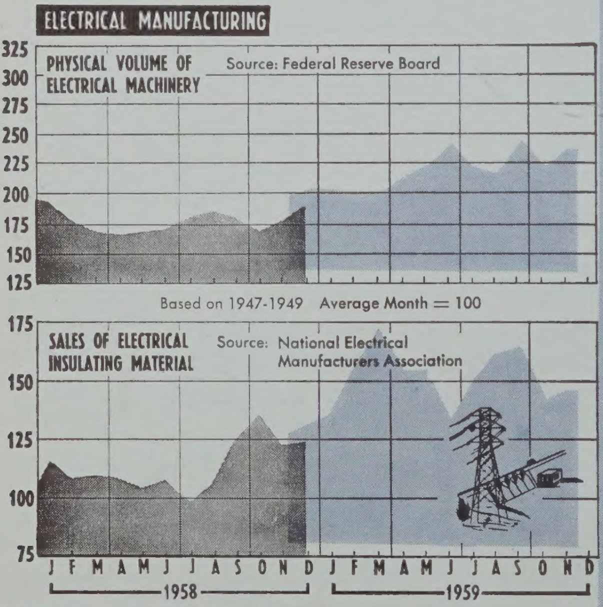
Gas utility construction, based on figures from companies with assets of over $35-million, totalled $1,581-million in 1959 and will be about the same in 1960. Financing for these companies totalled $1027-million in 1959, and partial figures indicate the amount may be somewhat lower in 1960.

Public offerings scheduled so far for the second quarter of 1960: Electric: somewhat over $197-million total, Bonds $159-million, preferred $3-million, common $10-million plus some additional, and securities of a type not yet determined $25-million; -- Gas: $85-million total, all Bonds; -- Telephone: $40-million total, all bonds.

MARKETING GUIDEPOSTS


INDEX OF PRICES Source: U. S. Dept. of Labor (1947-1949 = 100)

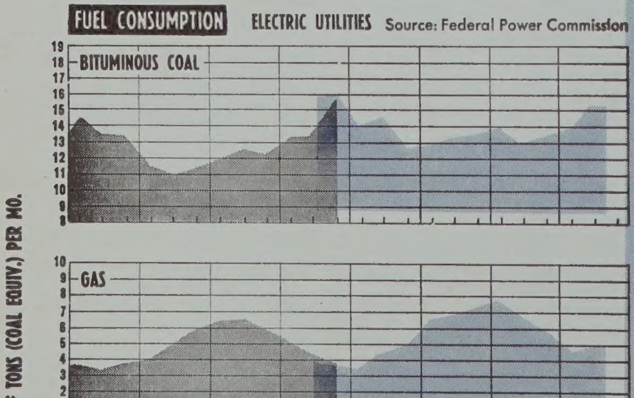
SPOT PRICES IN PRIMARY MARKETS AVERAGE OF 13 COMMODITIES

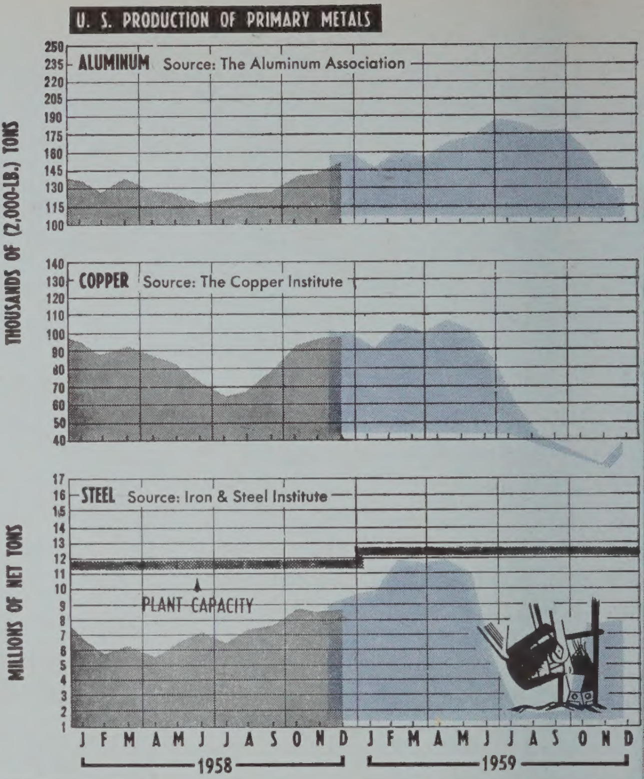

ELECTRICAL MANUFACTURING

PHYSICAL VOLUME OF ELECTRICAL MACHINERY Source: Federal Reserve Board

Based on 1947-1949 Average Month = 100

SALES OF ELECTRICAL INSULATING MATERIAL Source: National Electrical Manufacturers Association

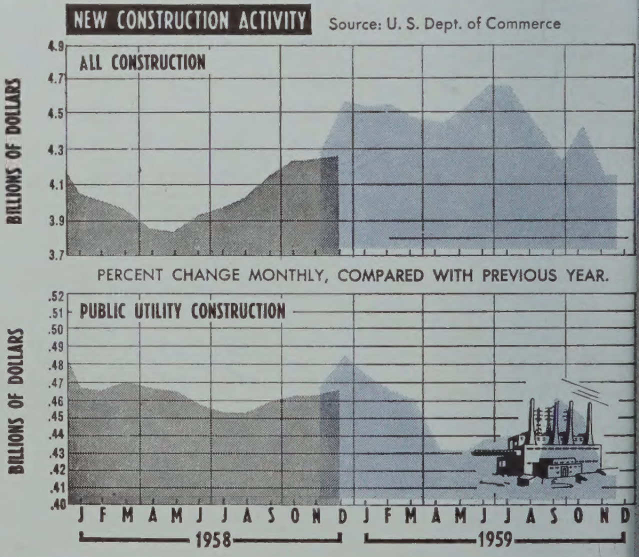

FUEL CONSUMPTION ELECTRIC UTILITIES Source: Federal Power Commission


U. S. PRODUCTION OF PRIMARY METALS

ALUMINUM Source: The Aluminum Association

COPPER Source: The Copper Institute

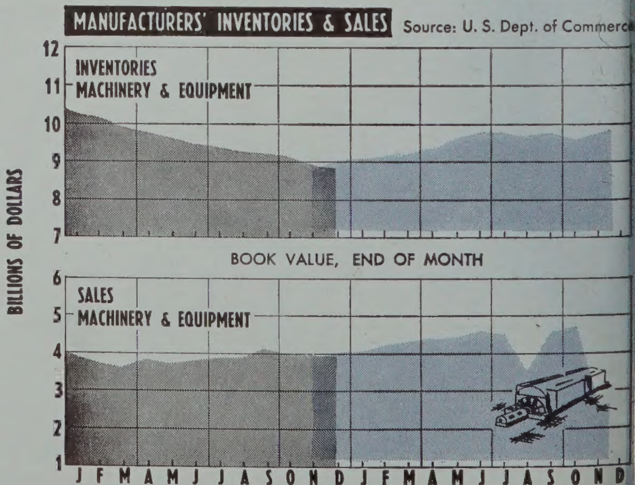
STEEL Source: Iron & Steel Institute


NEW CONSTRUCTION ACTIVITY Source: U. S. Dept. of Commerce

ALL CONSTRUCTION

PERCENT CHANGE MONTHLY, COMPARED WITH PREVIOUS YEAR.

PUBLIC UTILITY CONSTRUCTION


MANUFACTURERS' INVENTORIES & SALES Source: U. S. Dept. of Commerce

INVENTORIES MACHINERY & EQUIPMENT

BOOK VALUE, END OF MONTH

SALES MACHINERY & EQUIPMENT

onEd's Eble Tells ASME:

Aust Do Better Job ecruiting Engineers

Our industry today is confronting echnical challenges no less formidble than those of the glamour inustries . . . and in the electric ower field, the problem of attractg a reasonable share of the highly mpetent young engineers has een increasing, Consolidated Edin's Pres. Charles E. Eble acnowledged in an address for the IEE winter general meeting.

The ConEdison chief executive sked: "Unless it is solved, where an we expect to find the kind of ngineering leadership that will enble us to maintain our technical reeminence in this field? The soluon of this problem is of concern ot only to the interests of our inustry, but to the national interest s well.

"It is in the technical area that see the greatest challenge to our ower industry from Russia in the ecades ahead. One of the things at impressed me greatly everyhere we went in Russia was the edication, enthusiasm, and cometence displayed by the people andling the engineering, operaon, and construction at the varius establishments we visited. And e mere size, complexity, and umber of the projects we saw incated the wealth of engineering d technical talent that has been rought to bear on this basic phase their industrial activity.

"They have employed incentives hich make it so desirable to be engineer that there are thounds more candidates than could ssibly be used. They have glamrized the profession. They pay gher rates for engineering talent terms of money and preferential eatment. They completely finance e education and training of those young people qualified and selected for engineering careers. As a result of all this, the engineer has a definite high status in Soviet society with benefits far and beyond the means of the bulk of Russian people. They are obviously building for both the present and the future by creating a vast pool of engineering talent.

"Our ability to meet the Soviet challenges in the electric power as in other fields hinges importantly on our continuing success in developing new engineering talent. In a free society, we cannot direct people into the engineering field. Similarly, when people enter this field, we cannot direct that they become chemical, or electrical, or civil, or mechanical engineers. Nor can we direct that they go into this industry or that industry. In our competition with a totalitarian state, this might seem a big handicap, particularly in view of the relatively pat solution the Soviets have to this problem.

"In my mind, however, this is not a handicap, but the source of our strength. We have grown to greatness because our system is based on freedom of the individual, and this freedom has served to bring out man's finest efforts.

"I've heard some badly informed opinions to the effect that the power industry has solved all its technical problems and it's just a matter of doing the same thing over and over again to keep up with growth. The challenges ahead for our industry in nuclear energy, higher voltage transmission, direct conversion of heat into electricity, thermonuclear power and solar energy call for technical competence of the highest order. Clearly, our industry hasn't done the job of selling itself well enough to engineering students, and it's a job we must do better in the future," he warned.

EEI's King: Automation — "Two-Way Growth Factor"

Without electric power, automation would probably not even be a word, EEI's Pres. Allen S. King told the N. Y. Society of Security Analysts in a recent address. You can appreciate why this field, in which we are making great studies, is especially significant to us, he added.

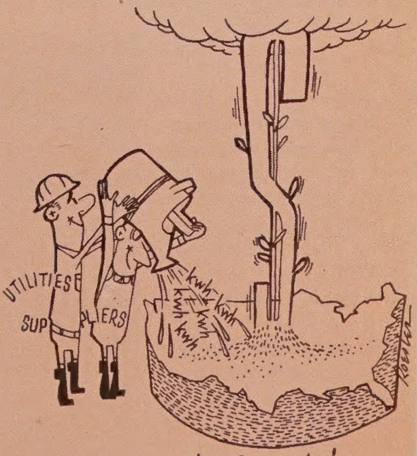
Here's how he described the utility industry's interest in automation:

"We are entering the era of automatic operation of entire electric plants, through the use of electronic computers. This will be an important step in keeping manpower costs down, as the industry's power-making ability continues to rise.

"Computers are coming into increasing use to control the output of complete systems, involving as many as three dozen generating units.

"In the accounting and billing functions, electronic data processing systems are taking on more and

(Continued on next page)



Economic Growth!

For sum-up of ways electric utilities and their suppliers plan for bigger future, see Conference Report, page 47.

Edison Award Bids to:

Commonwealth, Detroit Edison, Duke Power, United Illum., West. Mass. Elect.

Outstanding records in such diverse areas as civic action, employee training, the development of steam, hydro and nuclear power sources and the promotion of space heating uses won for five utility companies the distinction of being named "finalists" in the annual competition for the Edison Award. Cited for achievements in the year 1959 are:

Commonwealth Edison Company
Detroit Edison Company
Duke Power Company
United Illuminating Company
Western Massachusetts Electric Company

Following are the Review Committee's reasons for the selection of each of the nominees:

Commonwealth Edison Company—For its enlightened, significant contribution toward development of economic nuclear power by its intensive efforts culminating in achievement of critical operation of Dresden Nuclear Power Station, the country's initial full-scale reactor plant completely financed by private enterprise; for accomplishing the objective within time and cost estimates; for outstanding efforts in construction of low-cost residential electric space heating.

Detroit Edison Company—For outstanding business statesmanship in promoting civic responsibility among its employees through the sponsorship and development of its "applied citizenship committee"; for providing the necessary training facilities for developing an informed electorate; and for encouraging employee participation in political and community activities; all leading to the preservation of the traditional American free enterprise system.

Duke Power Company—For completion of engineering planning of the Catawba River Development, involving thirteen hydroelectric plants and five steam plants; and for carrying forward an outstanding employee training and management development program, together with a notably effective effort to achieve improved customer and public relations.

United Illuminating Company—For outstanding leadership in promoting large-scale urban redevelopment in New Haven, Conn.; and for fostering active participation of its executives on civic committees and in urban development programs in its service territory.

Western Massachusetts Electric Company—For research and promotion in developing successful application of electric space heating to commercial buildings in cold climates; for furthering experimental heat storage systems to implement such installations, including one in the company Systems Headquarters buildings; for instituting promotional rates for such service; and for continuing aggressive development in the residential space heating field.

Final selection for the Edison Award will be made before the EEI annual meeting. Serving on this year's Review Committee were: P. B. Garrett, editor and publisher of EL&P (chairman); C. W. Leihy, editor and publisher of ELECTRICAL WEST; and C. F. Hochgesang, editor of ELECTRICAL WORLD.

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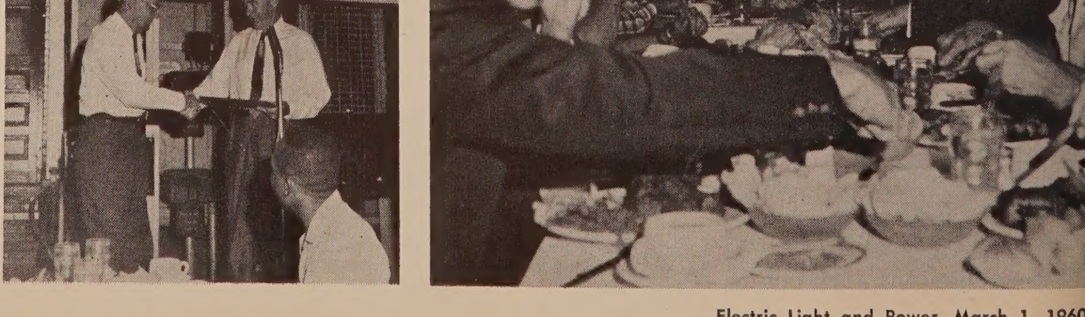
more of the chores which otherwise would put a growing load on clerical and office personnel.

"Versatile computers are also being used to make complex engineering and system studies, and are of great assistance in planning for the most effective and economic expansion of systems to meet future load requirements.

"The electric industry is in a unique position regarding automation, because for us it is a two-way growth factor. Applying techniques of automation helps the utility companies in their expansion and in economic production of power, and the increasing application of automation equipment and methods in other businesses builds the sale of electricity," Mr. King pointed out.



Boiler room of Tampa Electric's oldest power station was picked as "most fitting place" to hold dinner to celebrate outstanding safety accomplishment—more than 2-million man-hours without a disabling injury over 11 years. Outside caterer set tables, but Chefs "Barney" Johnson and "Ham" Moshell, Jr. (Tampa officials) prepared charcoal broiled steaks, "right on boiler room floor." Tampa Pres. Wm. C. MacInnes (left) presents EEI Safety Award to Chief Engineer Johnson.

NUCLEAR NEWS

EW AEC REACTOR STUDIES, prepared for distribu-
on early in 1960, are entitled: “Summary of Cur-
ent Status of Reactor Concepts,” and “Economic
otential and Development Program.” The latter re-
ort is to contain an analysis of the technical gains
nticipated for each reactor concept over the next
everal years. The Commission's 10-year power reac-
or development program, presented in the annual
ec. 202 hearings before the Joint Congressional Com-
ittee, is to be under continual review . . . and “modi-
ed as indicated by developments.”

ROM 9-13 MILLS/KWH to 7-8.5 mills/kwh—That's the
ost reduction hoped for by the AEC as the goal
f further reactor development and construction pro-
rams, as described in the recently distributed AEC
nnual report. According to the report, a 300,000-kw
uclear powerplant would be competitive today with
conventional generating station of the same size only
conventional fuel costs were 54 cents or more per
tu. Such conventional costs, the report added, “pre-
ail in only a few isolated areas of the U. S.”

ASTES WON'T STRANGLE U. S. industry, the AEC
ssures the Congress in its annual report. Govern-
ent-controlled sites for disposal of radioactive waste
aterials are to be established as needed, with state
overnments expected to assume responsibility for
stablishing and controlling such sites as the atomic
nergy industry grows. Such a site—to take care
f all of the wastes expected to be generated in
6 states of the Northeast between now and 1980, for
xample—would need to be no larger than 200-300
cres. (Meanwhile, pending the establishment of per-
anent sites, the use of interim sites at AEC installa-
ons is being considered and a pricing schedule for
se of such land burial facilities is being prepared.)

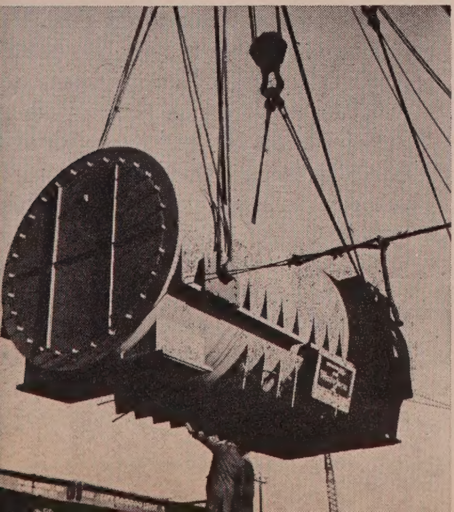
NUCLEAR PRODUCTION PROBLEMS—those considered to require more clarification and study—will be the subject of all of the 57 technical papers to be presented in the 1960 Nuclear Congress “streamlined program” in New York City's Coliseum, April 4-7. Dealing with seven major areas, the papers will include 17 devoted to reactors, plus four more on reactor design; 12 on environmental problems; nine on materials and components; and four each on nuclear standards, isotopes and radiation processing. (Three papers are scheduled for the opening session of the Congress.) Papers are being printed separately in pocket-size booklets, to be sold for 50 cents each.

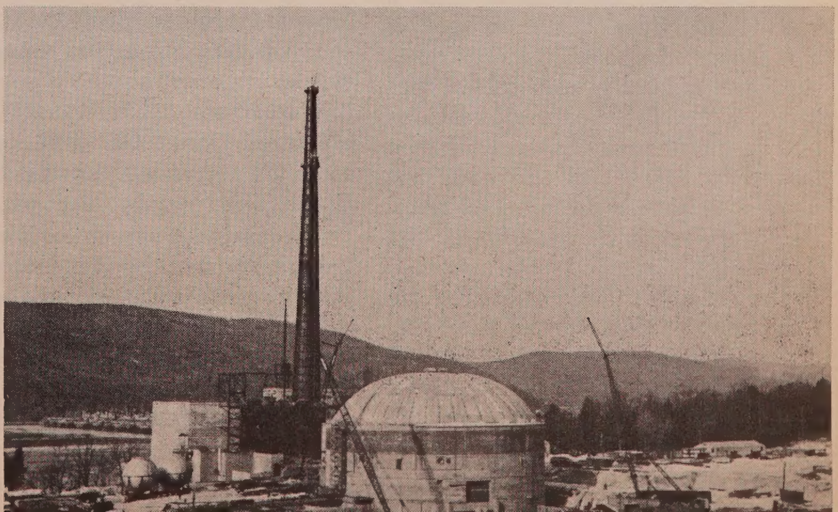
INDIAN POINT STATION will operate with 14 union members to a shift, the Local's business manager disclosed when top union officials toured the site of the ConEdison project recently. He observed that this is “no less than the standard crew in any modern generating plant.” (ConEd officials advised that no more than 20 employees will ever be in a position to experience radiation in the 275-megawatt plant.)

WORLD'S LARGEST REACTOR—a 650-megawatt unit—is to be built on England's east coast (at Sizewell). Cost of the plant is estimated at $182-million, with completion set for 1965. (By 1964, a 20-megawatt high temperature gas-cooled reactor experiment is to be operating, at Winfrith, where a research prototype for establishing the larger machine's design characteristics is now in operation.)

FREE WORLD NEEDS for uranium metal could approach a $7-billion market for uranium producers by the early 1980's, predicts Allen D. Gray, president of Susquehanna-Western, Inc., which operates two of the nation's 26 uranium producing plants.

ant generator (stator and 105-ton rotor) for ConEd's Indian Point
ation—a 448,000-pound lift—is one of heaviest ever made by floating
derrick in Port of N. Y. Westinghouse unit is now being installed at
site in Westchester county, where plant is to start operating in 1961.





by **RALPH ELLIOT**
Washington Editor

Snake Plus Fish Equal Mountain Sheep

When Pacific Northwest Power Co. later this month launches its second bid to the Federal Power Commission for authority to develop needed hydro-power and flood control on the middle Snake River, it will be under circumstances far more favorable than those which attended its first, and unsuccessful, effort back in 1956.

Brightening PNP's prospects is a decided change in the Snake River picture—a change which deflates the opposition from public power quarters, and largely undermines the basis for FPC's decision turning down PNP's first application. Credit for the change must go to what are called anadromous fish.

PNP's initial proposal, which called for two low dams at the Mountain Sheep and Pleasant Valley sites, failed to win a license because FPC found that such proposal was not "best adapted" to a comprehensive plan for developing the river. The Commission's key finding, based on Army Engineers' studies, was that no development plan could be considered the "best plan" unless it included a high dam at the downstream Nez Perce site. And construction of Mountain Sheep-Pleasant Valley would preclude development of Nez Perce.

For the public power intervenors, who had been contending that a high federal dam should be built at Nez Perce, the Commission's decision was a totally unexpected victory. FPC's chief hearing examiner had recommended that a license be issued to PNP, and the odds appeared so heavily in favor of adoption of the recommendation that the opposing groups had even resorted to the delaying tactic of asking the Commission to defer its final decision pending completion by the Corps of Engineers of a re-study of the Main Control Plan for the Columbia River.

In dismissing the PNP application, however, the Commission in effect invited the company to seek a license for Nez Perce. It pointed out that that project appeared to be economically feasible for either federal or private development. But the company was less than enthusiastic over the invitation. The biggest hitch was the inevitable conflict over the locally sensitive matter of protecting fish resources. Nez Perce is below the confluence of the Salmon and Snake Rivers, and a substantial percentage of the Columbia River fish run uses the Salmon for spawning. So with no proved method yet in sight for safety passing downstream migrants at high dams, Nez Perce was low on the damsite hit parade.

The multi-purpose project now proposed by PNP, and scheduled for FPC hearing starting March 21, calls for a single high dam at Mountain Sheep, a half mile upstream from the Salmon River. The project would have an ultimate capacity of about 2 million kilowatts and is estimated to cost $250 million, including transmission facilities.

Meanwhile, the Corps of Engineers has completed its Columbia re-study, and its revised "308 Report" recommends that Nez Perce be by-passed in favor of a high Mountain Sheep project. The reason: fish. Nez Perce, the report says, would intercept about 43 percent of the anadromous fish passing over McNary Dam. Of that amount, some 28 percent go up the Salmon River. The report continues:

"From the viewpoint of flood control and power the Nez Perce project, if constructed in the near future, would provide the optimum development of this reach of the lower Middle Snake River. However, the problem of passing migratory fish at high dams, in th opinion of authoritative sources cannot be resolved in less than to 10 years, and, because of th unique fisheries problem, at leas 15 to 20 years might be necessary t resolve the problem that would b created by the Nez Perce projec

"The water resource potential o the lower Middle Snake Basin als can be realized through construction of the High Mountain Shee Dam on the Snake River and th Lower Canyon Dam on the Salmo River. This combination will produce greater benefits than the Ne Perce project but at a greater cos and a lower benefit-cost ratio.

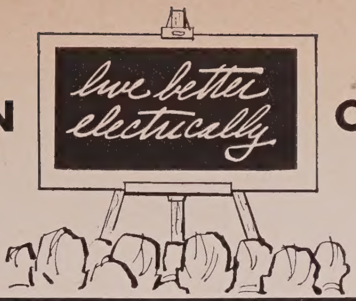
"The High Mountain Sheep project could be constructed now without being a serious hazard to th anadromous fishery, since it woul affect less than 3 percent of the fis run passing McNary Dam in addition to that already blocked b existing projects on the Middl Snake River.

"Since construction of either th Lower Canyon project or the Ne Perce project is precluded until th fish problem is solved, which ma be as much as 15 years or more, th benefits that would be realized from the High Mountain Sheep projec during the period of delay woul outweigh the economic superiorit of the Nez Perce project."

The report also noted that PN has applied for a license to buil High Mountain Sheep, and state that "If this license is granted an development at this site should b equal in scope and purpose to th project recommended in this report."

Kinsey Robinson, chairman o PNP and president of Washingto Water Power, said last month tha the company's Mountain Shee plan is "equal in scope and purpose" to the Corps' recommendations.

INDUSTRY IN CONFERENCE



Look for 'Hidden Values' . . . Turn To 'Trend Buying', Manufacturers Urge PA's at Utility Buyers' Meeting

RECORD REGISTRATION of more than 900 was achieved by the NAPA Public Utility Buyers at their Atlanta, Ga. mid-winter conference. The Group will meet in Detroit next year, in San Francisco in '62 and in Pittsburgh in '63. Newly elected to the executive committee are: D. E. Nesbit of Duquesne Light Co., J. P. Blumer of Gulf Power Co. (Pensacola, Fla.) and Frank Sherman of Laclede Gas Co. Appointed to a newly established advisory committee are: J. R. Carmichael, Mark Covell, J. D. Hogg, W. H. Jones, C. F. Ogden and L. Glen Wisely.

/hat Buyers Butler, ole, Covell Criticize:

More satisfied with his negotiat-g position, perhaps, than he has een for some time, the utility buy- today maintains the viewpoint at "things could be better," nev-rtheless. Expressed in different ays by several of the speakers on e NAPA Public Utility Buyers id-winter conference in Atlanta, a., last month, this not untypical A approach flavored the discus-ons with such pointed questions :

Shouldn't the manufacturer be ft with additional incentive to eep under control contract por-ons subject to escalation?

Shouldn't economic differentials reflected in prices charged?

The utility buyers who reviewed ese and other controversial mar-eting considerations at the confer-nce included Alabama Power's eorge Cole, Commonwealth Edi-n's Oliver D. Butler and Union ectric's Mark Covell.

George H. Cole, manager of pur-ases for the Alabama Power Co., lled for "more realistic pricing actices, with due consideration of fferentials and economies in the arketing operations." He offered number of examples of what he ferred to as "abuses" of pricing actices, in which, he acknowl-lged, uniformity is part of a long-rm trend.

"Some of us are objecting to prac-ces such as these:

1. Where direct transaction be-veen the manufacturer and the ility is the most logical channel, r economic, service and other rea-ns, shouldn't any economic dif-rential be reflected in prices?

2. In the case of certain products involving a large differential in costs at destination, based upon transportation, quantity and other savings, shouldn't the manufacturer pass on to the utility these savings, or a substantial portion of these savings in prices quoted?

3. Doesn't the Robinson-Patman Act provide for price differences when differences in costs are established (such as economies of transacting business, of transportation and larger quantities)?

4. Shouldn't the purchaser have a position in the application of price advances (particularly resulting from price increases on basic metal components) under escalation policies?

Mr. Cole offered advice concerning the utility's internal approach to transacting business with its suppliers:

"There are a tremendous number of man-hours expended within our own organizations. In the complexities of modern utility requirements more contacts with vendor representatives over a wide area of the

(Continued on page 51)

Suppliers: Action Now For Industry's Future

From the suppliers who addressed their NAPA Public Utility Buyers conference, the PA's got the most provocative interpretations of the conference theme: "Tomorrow's Problems Today."

"Look for 'hidden values' in what you buy," advised one. "Turn to 'trend buying' ", urged two others . . . And, it was readily evident these manufacturers representatives felt strongly that more action in such directions would go a long way toward solving, or eliminating problem situations in years ahead.

'Hidden values' in electric power equipment were effectively illustrated by C. W. Mills of Westinghouse, while the urgency of the 'trend buying' proposal was argued equally effectively by GE's Wm. S. Ginn and Combustion Engineering's Donald S. Walker.

Each utility, regardless of individual circumstances, should consider carefully the planning of its next capacity additions on the basis of the growth trend method which history has demonstrated to be a valid approach, recommended Mr. Ginn, who is vice-president and general manager of the General Electric turbine division.

"Your acceptance and faith in the growth trend approach will make a significant contribution, not only to your management's operations in forecasting your future capacity requirements, but also to the electric utility industry as a whole—in keeping the cost of power low," promised the GE executive. "Those connected with this industry are well aware of a terrific upgrading in what purchasing can do. Approach this (challenge of trend buying) with a positive attitude . . . and let's see what can be done to improve on past performance."

Mr. Ginn outlined the well-known cyclical buying pattern and its consequences this way:

"In the difficult technical area, we have been able to solve our problems . . . but in the business, or nontechnical, area where one would expect solutions to come a little more easily, we have not been so successful. In this business area, the crucial problem causing us so much difficulty is cyclical buying by the electric utility industry. It is because of this factor that the electrical industry has been unable to exploit the full potentialities of its technological progress. Cyclical production, which stems from cyclical buying, leads to costly maladjustments and price increases. This problem, which is plaguing our industry, is one that deserves careful consideration.

"The electric utility industry, as a whole, follows a highly cyclical pattern in making its additions to generating capacity. This pattern consists of a cycle that runs approximately five years between peaks. For example, at the initial peak in 1954, steam turbine capacity additions amounted to 10.5-million kilowatts; in 1956, they dropped 54-per cent, to 4.8-million kilowatts; in 1958, they shot up sharply by 160-per cent, rising to 12½-million kilowatts. Such a situation, apparently normal to the electric utility industry, is utterly fantastic, and presents the equipment manufacturers with critical economic adjustments.

Manufacturers: Ways Costs Are Cut

Utility buyers heard representatives of leading industry suppliers tick off a number of ways they *have saved,* or *could save* substantial amounts of money through equipment purchases. Here are a few:

"HIDDEN VALUE" SAVING—In the purchase of a 250-megawatt turbine-generator unit today, compared with equipment providing the same capability with technology of 25 years ago, there are estimated fuel cost savings alone of $40.6-million, plus other savings (through improved efficiency of the new machine and related equipment) that make the total savings "staggering."—C. W. Mills, of Westinghouse

"ADVANCED" BUYING SAVING—As much as $75,000 on a $1-million order for boiler equipment.—D. S. Walker, of Combustion Engineering

"TREND" BUYING SAVING—Estimated industry savings potential of over one-half billion dollars in the next ten years, resulting from economies effected through stabilizing manufacturing production.—W. S. Ginn, of General Electric

"The burden of the cyclical problem, as it stands now, will grow in future years. The difference between the trough and the peak in future cycles (through 1970) will exceed *all* capacity additions in the single year of 1959. Thus, the outlook for the equipment manufacturer is far from encouraging, and the same holds true for the electric utility industry which has created this situation.

"The fact should be clear that cyclical production is the result of cyclical capacity additions. Cyclical production deserves condemnation because it militates against our determined efforts to achieve progress. Cyclical production gives rise to many inefficiencies, among whic are: (1) over-expansion in pla and facilities to meet peak demand for equipment, (2) violent swing in the size of the labor force, necessitating far more than norma amounts of hiring, training, and discharging, and (3) increased socia benefits demanded and received b labor to meet the uncertainties created by cyclical production.

"The detrimental effect of cyclical production on employee moral simply cannot be stressed enoug Alternating years of high and lo employment are bound to kee labor in a dissatisfied frame of min The situation is ominous; howeve even though time is quickly ru

Utility buyers panel session headed by Philadelphia Electric's John M. Warner (second from right) included (l. to r.): Wm. S. Ginn of General Electric; Oliver D. Butler of Commonwealth Edison; and Donald S. Walker of Combustion Engineering, Inc.

Session under the chairmanship of PG&E's Frank Baxter (at right) i cluded (standing): C. W. Mills of Westinghouse and J. Theodore Wol of Baltimore Gas & Electric Co.; and (seated) EEI's Edwin Vennard an George Cole of Alabama Power.

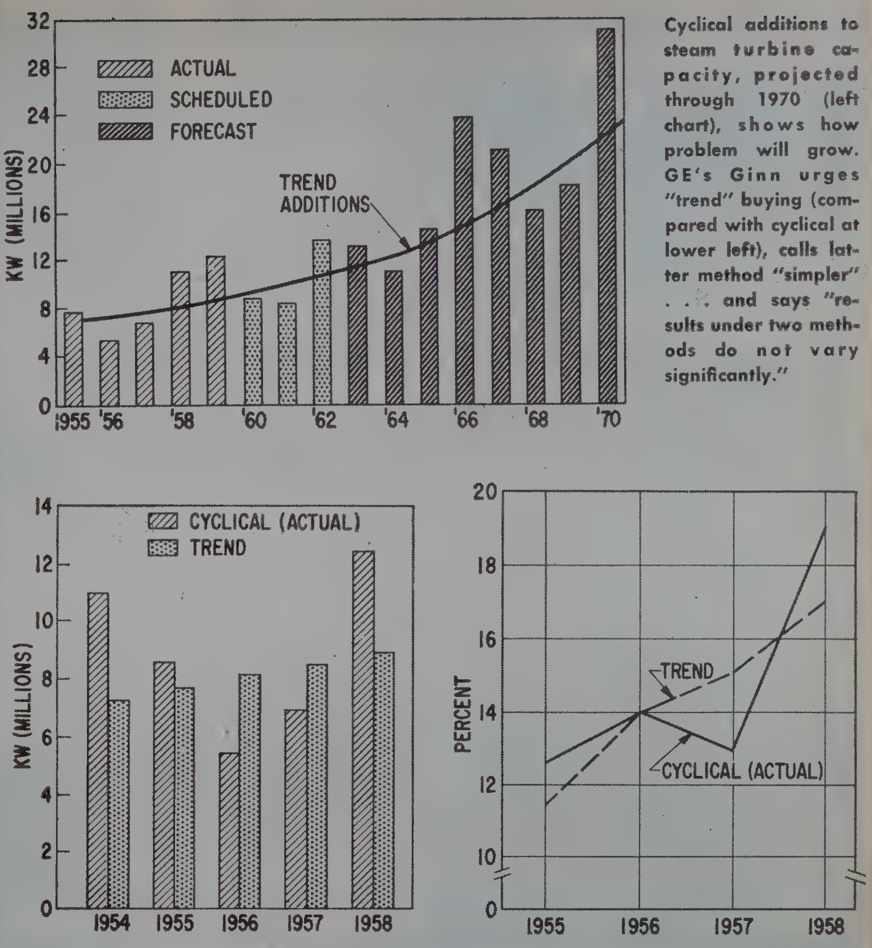
ng out on us, a change in the elec- ic utilities' buying pattern could lp to stave off industrial unrest.

"These inefficiencies of cyclical oduction are reflected in higher sts—and these costs are higher by small margin. Every production ctor is adversely affected by cycli- l manufacture. The fact of the atter is that production costs tend run over ten-percent higher un- r cyclical conditions than they ould under more stable condi- ons.

"The answer to this problem— d it is a mutual one—is a stable oduction pattern. Stable produc- on would tend to make for more able costs. The result would be hold the line against the ten- r cent rise that would occur under clical conditions, and so make ssible substantial savings to the ectric industry. And, stable pro- ction actually would permit a wering of costs because it would low improvements in productivity occur without the obstruction used by the cyclical factor.

"For the electric utility industry, this has important implications. presents you with an opportunity save your respective companies immense amount of capital. With sts under control, prices will drop incident with gains in productiv- y. In view of this fact, you could ve for your companies, according our estimates, over one-half bil- on dollars on purchases made over e next 10 years.

"If this figure staggers your imag- ation, let me remind you that it esents only a fraction of the total savings that would result from a stable production pattern. Under such conditions, manufacturers of other power plant equipment, who also suffer from the cyclical disease, would have this burden removed. Hence, they too would be able to control costs better, and to pass on to the electric utility industry the gains arising from improvements in productivity. Savings to you would mount up on all sides.



Cyclical additions to steam turbine capacity, projected through 1970 (left chart), shows how problem will grow. GE's Ginn urges "trend" buying (compared with cyclical at lower left), calls latter method "simpler" . . . and says "results under two methods do not vary significantly."

"What should the electric utility industry do to assure itself of these tremendous savings? You would have to add capacity to your systems on the basis of the requirements indicated by the historical growth trend. Undoubtedly, our recommendation that you adopt trend buying may cause doubts and apprehensions as to its feasibility. We understand clearly your concern that trend buying might involve, in some cases the installation of equipment sooner than it otherwise might be needed.

"There is no denying the importance of this consideration. But, the fact that the results under the two methods of buying do not vary by a significant margin argues for the use of the simpler of these two approaches when purchasing power generation equipment. It is definitely easier to forecast the trend values than the fluctuations around the trend. Moreover, fluctuations of actual peak loads around the growth trend line are relatively small, so that the growth trend projection is effective for forecasting future power requirements.

"Moreover, growth trend additions would impart the same stabilizing effect to employment in the electric utility industry that a stable production pattern would to employment in the manufacture of large steam turbine-generators.

"Tremendous savings are still in store for many of the nation's electric utilities as they prove to themselves the practicality of installing larger capacity turbine generators. The equipment manufacturers are pledged to continue their all-out effort in making improvements which will help keep the cost of power low. We are certain, how-

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OULD UTILITY PA's look harder at e possibilities for buying ahead, urged by their suppliers? The ey question was largely unanswer- ble, though there were indications the NAPA conference of new in- rest. Examples: Session Chair- an John M. Warner (Philadelphia lect. Co.) remarked, "We want to ooperate . . . and some things are our minds as to what we can ain"; and Alabama Power's eorge Cole advised, "With prices d escalation on a more realistic asis, utilities might well consider rdering further ahead on known quipment requirements . . . with opes that economies established ill reflect in prices to us."

NAPA Group's committee on local arrangements, gathered at registration desk, included these Georgia Power representatives (l. to r.): seated —J. F. Pennington, Jr. and W. H. Thomason, Jr.; and standing— H. P. Williamson, J. R. Carmichael (general chairman) and J. L. Botters.

Top NAPA officials who participated in the Atlanta meeting were (l. to r.): T. O. English, Aluminum Co. of America, and president of NAPA; Mark B. Covell of Union Electric, R. B. Gear of Commonwealth Edison, C. F. Ogden of Detroit Edison, J. B. Homsher of Gilbert Assoc.

ever, that these savings are but a portion of the total potential savings which are available to your industry. By resolving the problem of cyclical buying, further and equally significant savings are within your grasp," Mr. Ginn advised.

Combustion Engineering's Vice-President Donald S. Walker, underscored the urgency of stabilizing production in manufacturing operations, saying, "We have not learned to cope with empty shops and expensive idle equipment."

Mr. Walker explained how expensive it was to respond to the cyclical extremes of utility purchasing patterns. When CE in 1956 got double the volume of orders of a year earlier, it was necessary to boost shop employment from about 3100 in '56 to some 6400 in '57, he noted. Due to the training problems involved in hiking production in CE shops, seven-per cent more man-hours were needed to produce the same output that first boom year (1957) as the following year of '58.

"It is necessary for both suppliers and buyers to work at changing this cyclical buying," Mr. Walker warned, " . . . and the need is to change the point of view—the 'traditional approach' to it. If we can keep our labor force level, and if we can be relieved of uncertainties (related to labor and materials) in our shops, we can certainly pass on the results in benefits to our utility customers," he proposed.

Mr. Walker also used his own company's experience to illustrate how difficult it is for such a supplier to maintain a healthy financial status while serving the utility industry.

"Combustion Engineering's income as a per cent of sales is only a fraction of the average in the utility industry," he pointed out. Defending the need for escalation provisions in contracts (which he said cover less than half of the production period), the CE executive declared: "If it had not been for escalation, CE would have had a loss instead of a profit in the past few years."

Mr. Walker aired these "gripes" about utility procurement practices:

1. The indulgence in (the costly procedure of) calling for suppliers to offer propositions on several sizes or types of equipment, when the purchaser hasn't made up his mind about what he wants.

2. Over-use of proposition engineering studies (which, he said, could add as much as $600,000 to the costs of a single order).

3. The expensive post-contract changes . . . and the failure of utility expediters to report back to their companies the affects of such unexpected engineering changes on delivery performance.

Mr. Walker cited the performance of "three courageous advance buyers" who have helped to fill the valleys in the utility industry's cyclical buying . . . and offered to all PA's help in "filling the chuckholes in your purchasing path."

C. W. Mills, manager of the electric utility sales department of Westinghouse, covered much of the area for which utility buyers are responsible in "finding and determining *hidden* values." In discussing the subject of getting more for the utility dollar, Mr. Mills said he meant, in part, "the research effort that goes into every product you buy from your major suppliers."

The Westinghouse executive added, "Of course, there are other hidden values to look for in spending your utility dollars . . . such as the service back-up on equipment, engineering services for which no charge is made, nationwide warehousing facilities, training services and advanced study seminars of all sorts which are available to your professional people. But most important is product itself . . . the fact that it has been pretested for reliability in service, so that your system isn't converted into a trial-and-error laboratory with consequent outages and the expense they entail. These things are tremendously important in stretching your dollars, and I'm sure you men can evaluate them better than I can."

Advised Mr. Mills, "Today with costs high, units big and expensive, systems sensitive and complex, capital hard to come by, there are no little errors, and no system can afford big ones.

"With millions of dollars in profit or loss riding on these decisions, you're going to need something more than a better bearing on a feed pump or a few reductions in the basic impulse levels on a transformer to see you through the decade ahead.

"In the next decade," continued the Westinghouse executive, "utilities will be called upon to build additional power systems equal to the ones you now have—truly one of the great challenges of our times. This calls for even greater teamwork between electric utilities and electrical manufacturers and total mobilization of all our resources, which you have available to you. (Ed. Note—Additional remarks of Mr. Mills will appear in EL&P, Mar. 15 issue.)

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utility organization are necessary n connection with technical considerations. But, there is opportunity in many utility organizations for etter control of solicitation on ther than technical grounds, with he view of conserving seller personnel expense, necessarily considered in establishing prices, and ur own expense of conducting purhase transactions.

"We public utility buyers are forunate in the generally high caliber f seller representatives with whom e have contact," Mr. Cole noted. 'As an information source, they ave been of much help in our job erformance. Their cooperation in cheduling has greatly aided in the ccomplishment of our programs. They and their organization reearch and development has conributed much to utility progress nd costs."

According to Mr. Cole, it is now ime for utilities to consider acting n another direction to make possile future reductions in equipment rices. "With prices and escalation n a more realistic basis, utilities might well consider ordering furher ahead on known equipment equirements . . . with hopes that conomies established will reflect in rices to us."

"When is an escalation clause a art of a good business transacion?" asked Oliver D. Butler, asistant director of purchases from Commonwealth Edison.

"If it is my belief that it is when he design and manufacturing peiod is longer than one year and he supplier is trying to win the usiness in a good competitive maret. If the industry manufacturing product has a relatively low marin of profit in a freely competitive market, it is to both the buyer's and roducer's advantage to share the isks of cost changes during the manufacturing period. Certainly he buyer does not benefit for long f he does not have suppliers that re financially healthy. Sharing the isk of cost increases, in a competiive industry, can work to the uyer's advantage by making reaonable profit margins possible on ach transaction, while fostering ealthy progressive manufacturing nterprises.

Mr. Butler listed three basic tests for a good escalation clause:

1. Is the correct percent of the price subject to escalation?

2. Is the correct basis, or index, to reflect change in production cost being used?

3. Is the period of time, during which escalation operates to change the price, correct?

The need for escalation must be considered on each purchase, he advised. He recommended this further procedure: "If it is found appropriate, then we shall strive to formulate a policy that will escalate the right *percentage of the price* with the right *indexes,* for the right period of *time.*

"This accomplished, should the buyer pick up the tab for the full amount? Shouldn't the manufacturer be left with some additional incentive to keep this amount under control?

"It should be recognized that when a manufacturer is receiving price increases on the basis of the behavior of an index into which he and his competitors report data, that manufacturer benefits who can keep his costs from rising as fast as the average of the group.

"The turbine-generator manufacturers, about the middle of last year, led by General Electric, I believe, took a step in the direction of assuming a share of responsibility for cost changes by shouldering the first 2.5-percent increase that may occur in one year. However, they left the time feature in the formula that over-escalates unless the buyer wants to swap that for additional interest costs during construction.

"The step to take some responsibility for increasing costs in encouraging, if it doesn't defeat the original purpose of escalation, which is to promote the maintenance of a healthy competitive industry with a reasonably low profit margin on each transaction. I believe we should encourage all those industries serving us, who by the nature of their products need some escalation protection, to accept an escalation formula that is built around the right percent of the price, the right indexes and the right time, then to share the cost, or benefit as the case may be, with their customers."

"A GOOD YEAR, 1960," says C. F. Ogden, who addressed his fellow PA's as chairman of the NAPA Business Survey Committee. Anticipating "a good year, all year," he expects the "4-minute mile" of U. S. economics—a GNP mark of $500-billion—to be exceeded this year. Also, he expects capital expansion investment to reach a near-record high. "Practically all materials are in good supply, competition will be intense, but prices will continue to inch up," he predicts.

Mark B. Covell, superintendent of supply service for Union Electric Co., spoke of some of the key considerations involved in "Purchasing's Role in Capital Equipment Buying." Prominent in his observations, of course, was the utility supplier, referred to in comments like these:

"It is up to all of us to spend more time and put in more thoughtful effort in the selection of bidders. Financial stability, technical and managerial competence—service facilities are some of the elements which need to be weighed carefully. The briefest look at the American industrial scene today indicates rising units and shifts among those who have been out in front. I am referring to the broad field of goods in which we invest capital, as well as in the selection of bidders for specific equipment requirements. Our sources, our own costs and risks need to be analyzed carefully to judge soundly—whether we may be striving for broader competition or when we consider restricting the number of suppliers."

Mr. Covell continued: "We are all acutely aware that we are best served by financially strong suppliers, but profits themselves without corresponding efficiency in all elements of manufacturing and distribution, do not necessarily imply long-time financial health.

"We need to recognize that what costs a producer money can in the long run only be recovered by the price, so let's stay as close as possible with nationally recognized specifications and with manufacturing industry standards. Striving for refinements costs engineering overheads for both seller and user and, especially if several bidders are involved, results in added sales costs.

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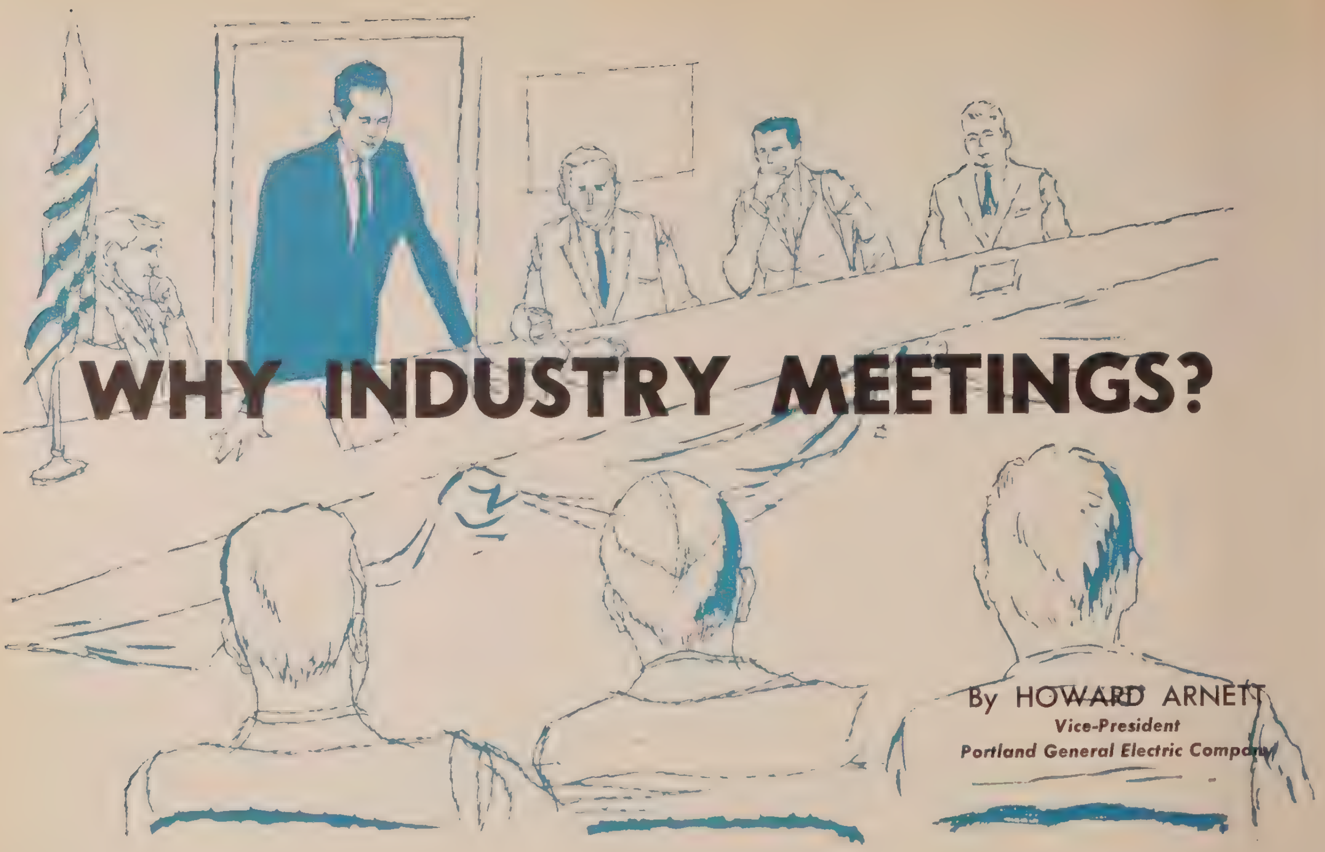

WHY INDUSTRY MEETINGS?

By HOWARD ARNETT
Vice-President
Portland General Electric Company

Meetings are the prime means for bringing about the communications necessary to voluntarily coordinate the various segments of our industry and the economy as a whole.

IN THESE SERIOUS TIMES we owe it to ourselves and others to have a fairly good idea as to just why the many meetings most of us attend regularly are an important and necessary part of our way of life.

An attempt to answer the question as to why industry meetings are necessary would appear to be timely, for there seems to be a growing awareness of the need for a more critical analysis of meetings. Many have begun to wonder about the ever-growing number of meetings and conferences that are paraded before us as essential, or at least very desirable, supplements to our regular activities.

Despite the relative magnitude of the world of meetings and conferences, there has been surprisingly little written about the underlying philosophy of them in recent times. Only questions have been raised. These questions, however, seem to be coming more frequently, as some point out the seeming overlap and even duplication in meetings—as well as a repetition in the material presented—even when this material is given under a different title. Others criticize the lack of unity and coherence often evident, the implication here being that programs have been thrown together in the interest of filling time rather than to present different facets of an important subject or around a central theme.

Those attending meetings need to have more than the simple conviction that a particular meeting was a fairly good one, and that most of the people attending probably got something out of it. Such feelings are often supplemented by expressions to the effect that the speeches were pretty good and that they saw and talked to a lot of people. While these comments are rather intangible and give the impression that the value of meetings cannot easily be measured, if at all, it is recognized that specific ideas are often acquired at meetings which can be applied directly, with substantial benefits realized.

We need rationalization for the times when we come home seemingly empty handed and asking ourselves—"Was it really worth it?"

Management, no less than its individual employees, needs a clearer understanding of the necessity for meetings and their role in modern life.

Those not participating, but witnessing meetings and conventions, must sometimes question the meaning and value of what they observe.

The formal and most conspicuous part of the meeting, of course, is the program with its speeches, panels, discussion periods and field trips. Around it all else must necessarily rotate. If the speeches are packed with food for thought and relate to the interests of the delegates, the program can of itself prove to be enough to guarantee success for a meeting. Success in this case would be measured by the feeling of the delegates that they

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Editor's note—This is the essential text of a talk given by the author before the November 1959 Hawaiian Conference of the Pacific Coast Electrical Association.

had been stimulated and inspired with new ideas.

Contacts Often Most Important

These rather self-evident statements would hardly need repeating here if it was not for the fact that to some individuals, the program is not necessarily the most important part of a meeting. To many, contacts and informal discussions constitute the most important activity of meetings. It is worth their waiting to select the proper meeting to make contacts with the right people in a short time and in a favorable atmosphere, that would otherwise require months if they were to attempt to call on all of them individually in their home offices.

The value of being acquainted, often on a first-name basis, with the responsible individuals in any organization can hardly be overemphasized.

Besides affording the opportunity to meet and become acquainted with a relatively large number of people, meetings are used on occasion to promote the intermingling of various levels of organization hierarchy. Although meetings tend to be somewhat stratified or oriented toward a particular group or level, there is usually sufficient depth in levels to achieve the desired effect. This is beneficial both ways. The top echelon can gather some kind of over-all impression from the people they meet, and the atmosphere surrounding the meeting, which is something they can all too easily be insulated from in pursuing their normal routine affairs. Likewise, the rising generation can obtain a view of the leaders in an atmosphere which is generally much more relaxed and intimate than would be ordinarily possible. All of this is a phase of displaying the corporate or organization image, which really goes on consciously or subconsciously all of the time, for an organization is measured by the kind of people representing it.

Stimulate Individual Growth

Meetings, through the programs and the informal contacts and associations, create the atmosphere in which individual growth is stimulated to the maximum. If true receptivity is present, there is no real limit to the possibilities for growth.

From all of this, it can be seen that the tangible value of meetings varies considerably according to the tastes of individuals. Those who attend to hear the speeches and glean something from them, as well as to participate in all of the informal activities, would seem to stand the best chance to profit. They are exploiting to the fullest the opportunity a meeting affords.

At the other end of the spectrum of enthusiasm is an attitude worth mentioning. Individuals belonging to this group contend that practically nothing can be gained from attending meetings, but that you cannot afford to stay away because of the damage competition might be able to inflict in your absence.

A Means To An End

Meetings are not an end in themselves—they are a means to an end. They do not exist of themselves, but rather because they are primarily one of the most important activities of associations, a fact which opens a door for exploration in this direction. Only by understanding something of the place of associations in our society can we clarify the position and importance of meetings. This is very important for America is the land of associations. Despite this, however, the concept of the place of associations, like that of meetings, has been hazy.

What we have grown up with and taken for granted as the normal way to conduct human affairs is a constant source of amazement to those who visit us from other lands. This propensity for forming associations is not new; it has existed in some degree since the founding of our country, for associations are inherent to our way of life.

The degree to which the art and science of association has been developed in America is measured best by the number of associations now functioning. At the present time, there are in existence more than 200,000 voluntary organizations which include those labeled associations, clubs, societies, lodges, etc. Trade associations, however, are our concern in this discussion, and there are around 13,000 of them now functioning at the national and local levels. In the electric power industry with its related components, there are about 1200 organizations of comparable and recognized stature. Our industry is truly well advanced in the art and science of association work.

With such a large number of associations in existence, it can be seen that America is completely overlaid with a fabric of organizations of one type or another which perform all of the duties not carried out by private enterprise and the government. They fill in the gaps in our economy and provide the lubrication of voluntary effort that helps make our society function so well.

De Tocqueville Reasoning

One of the first to take note of our practice of doing things through associations was a young Frenchman, Alexis de Tocqueville, who visited America in the 1830's. His philosophical observations and thoughts on our way of life set forth in his "Democracy in America" written 125 years ago are, for the most part, as true today as they were then, and are particularly valuable for their acuteness and depth. He reasoned that in a nation where the powers of the government are definitely limited and everyone is equal before the law, individuals find themselves weak and almost powerless to promote projects of any consequence and carry them out alone. They must necessarily seek out others having a common purpose and combine with them. In this way, they associate to become a power to be reckoned with in society as a whole. He came to the conclusion that the principle of action through association is the handmaiden of democracy and one can hardly exist without the other.

De Tocqueville made another very interesting observation which bears on this discussion, and that is that one of the products of the love of equality peculiar to democratic peoples is a constant tendency toward centralization of government. We are seeing it demonstrated all too clearly today. Men seek its assistance for this or that project while professing to want to hold it in bounds. Since it is the nature of government to ever wish to expand, we can see that every incident that occurs tends to promote the growth of the central government. The only antidote for this trend to the center is to do things for ourselves, and this means through associations.

Vast Need For Communication

It is through meetings that much of the work and achievements of an association, as well as the challenges and problems to be faced, are communicated to the members. It is in the formal and informal discussions at meetings that the vast pool of knowledge of common concern is constantly fed to the benefit of all.

For a dynamic association, meetings must be held often enough to provide the cohesion necessary to bind its members together in a common cause. Just as a man must refresh himself occasionally with a drink of water, it is necessary to experience a rebirth of the faith and enthusiasm that brought the association into existence. This rejuvenation can be accomplished only through the personal contacts possible at meetings. The amazing depth and breadth of general knowledge as well as the standardization of practices throughout the land are products of our ability to communicate.

Despite substantial progress, we need to constantly improve our ability to communicate for there is every indication that the job will become increasingly difficult. As society continues to become more closely integrated and complex, the test on our decentralized way of life will become more severe. We face the unrelenting task of having to learn more and more about more, and not less, as we so often hear. Because of this, the need for good horizontal communications between the many segments of our economy will grow apace, if not faster. With more communications necessary to bring about the voluntary coordination we have to achieve to move this economy of ours forward, it is reasonable to believe that we will need to get together either more often or more effectively. Probably it will be a bit of both, with more meetings in any given segment of the economy and with accompanying efforts made to make these meetings more productive.

No one needs to be reminded of how important, and often difficult, it is to pass the word to achieve coordination within one's own organizations where authority can be brought to bear. How much more of a task this can be when it is voluntary between important segments of any particular industry.

In our own industry this means that the general plans of everyone should be common knowledge. Utilities, manufacturers, distributors, dealers, and contractors should dwell more on the concept of themselves as vital parts of a larger entity . . . the industry as a whole. While this may sound a bit lofty, it is really not the case. Self-interest over the long haul will be better served through such a broad-gage view. Competition will, likewise, be served through wider dissemination of knowledge and equalization of opportunity.

Some of the amplitude of the cycles of supply and demand in the various segments of the industry could be reduced to a degree at least. As an example of this, the growing demand to smooth out the cycle of heavy equipment buying could be cited. This and many other similar cases indicate what remains to be accomplished in the field of improving coordination.

Expanding further, let us remember that we are but one industry in a very large and complex economy which likewise offers opportunities for improvement in coordination. This improvement is in no way a substitute for the law of supply and demand, but rather a means of taking some of the shock out of it at the best possible place . . . at the local level. This constantly expanding requirement in both general and specific knowledge places a heavy load on us. Nevertheless, we have no other course to follow if we are to preserve our way of life. What better way is there to exchange the necessary information at the right time and in the most painless way possible than through the many activities of our associations and, particularly, at our meetings.

Summary

There are many tangible and obvious benefits resulting from meetings. They are the means by which information is given wide circulation, new thinking stimulated and developed, ideas exchanged, enthusiasm generated and rejuvenated, policies developed, contacts and acquaintances made and renewed, and business conducted.

Associations are inherent to our way of living. They are part of and absolutely necessary to our decentralized free way of life. In this sense, meetings are the prime means for bringing about the communications necessary to voluntarily coordinate the various segments of any industry and the economy as a whole. This is a sufficiently high purpose to justify most any activity, and certainly our most sincere and consecrated efforts.

One Way to Improve Employee And Public Relations

THE EMPLOYEE INFORMATION CONFERENCE—

At very reasonable cost, this utility has obtained significant benefits from its employee conference information program—in management development, employee relations and more effective public relations.

By PAUL L. GUNN,
Director of Employee Relations,
Southwestern Electric Power Company,
Shreveport, Louisiana

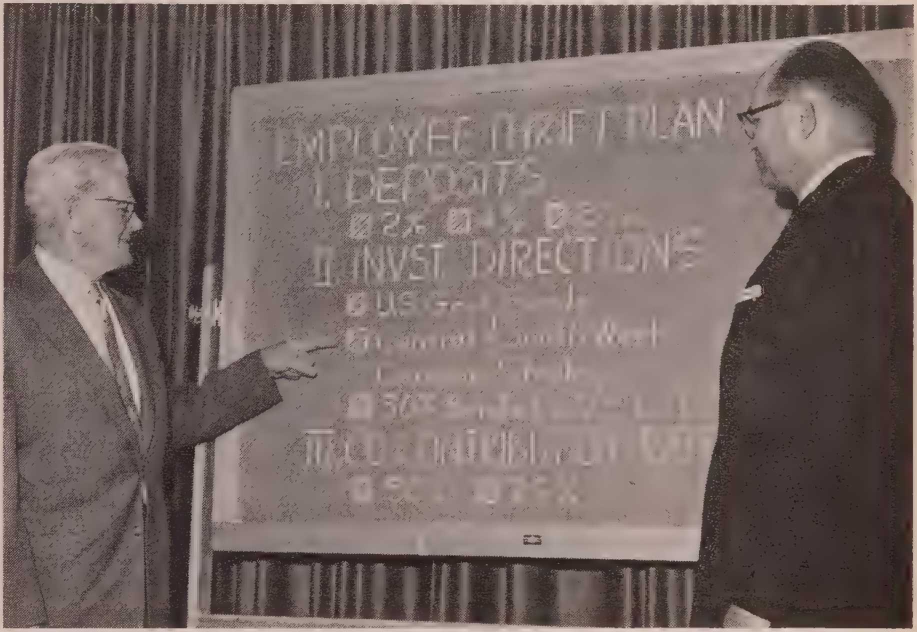
AFTER more than four years of experience I believe I can say with considerable assurance that better employee relations is one result which can be expected from a program of employee information conferences in an electric light and power company.

For about four years all of the employees in our company, a total of some 1400 people, have been members of permanent conference groups which have met six times a year under the leadership of trained employees who serve as conference leaders.

Each conference runs from an hour to an hour and a half, on company time, depending upon the subject matter and the degree of interest. In every conference the leader is prepared and supplied with a well-prepared conference outline. The subject matter of these outlines is developed in conference sessions attended only by conference leaders. The subject matter is frequently suggested by the employees themselves, but at other times it is suggested by the management. In either case, the material for the conference is prepared in rough form and then a "dry run" of the subject matter is made in a conference composed of the conference leaders themselves.

This has assured us of two things:

1. When we find a subject that is a dud, we replace it with one that has more interest and more benefit to the employees.



President J. Robert Welsh (left) of the Southwestern Electric Power Company points out to Paul L. Gunn, Director of Employee Relations, the highlights of company's Employee Thrift Plan as they were communicated to all employees through the utility's Employee Conference Program.

2. All conference leaders get a thorough briefing and practice in the subject matter of the conference before it is presented to the employees as a whole.

The employees were asked to suggest topics which they would like to discuss at these employee conferences. The management also suggested some topics which the management wanted discussed. The topics which we have used up until this time are represented in the list reproduced below. More than half of these topics were requested by the employees.

At the beginning of this program we uncovered a good many minor employee dissatisfactions. Some of

Topics Used in Southwestern's Employee Conferences

1. Basic Nature of the Electric Utility
2. Review of 1955 Operations — A Look Toward the Future
3. Government Ownership of Electric Power
4. Employee Benefit Program
5. Wages and Salaries
6. Review of 1956 Operations — A Look Toward the Future
7. Electric Power from the Atom
8. Customer Relations
9. The Customer, My Responsibility
10. Qualifications for Desirable New Employees
11. Tennessee Valley Authority
12. Review of 1957 Operations — A Look Toward the Future
13. American Economic System
14. American Economic System — Selling Our Services
15. American Economic System—Result of Operations for 6 Months ending June 30, 1958
16. American Economic System
17. Government Ownership of Electric Power
18. Review of 1958 Operations — A Look Toward the Future
19. "1104 Sutton Road"—Productivity
20. Company Sales Program
21. Group Insurance Protection
22. Rates and Rate Application

these were the result of misunderstanding but many of them were the result of some real shortcoming on the part of somebody in the management or supervisory levels. Things had been overlooked. When such sources of irritation were uncovered, we took the necessary steps to straighten out the matter to everyone's satisfaction, so far as this is possible. We had very few things that we were not able to straighten out.

One value of such a system of conferences is that irritations can be detected early. We found that as quickly as we gave employees a forum in which they could talk, they mentioned those things that were bothering them. Very often the correction of the misunderstanding required a full explanation of company policy. This in itself was a very good thing. It caused us to re-examine some of our policies and it gave us an opportunity to present and discuss these policies effectively with the employees. As a result, the employees understood and accepted the policies, although there are always some policies with which some employees disagree. Nevertheless, understanding the reason for the policy makes its acceptance a much easier thing on the part of the employee. It also improves the observance of the policies because they are understood.

To encourage open discussion we arranged the membership of our conference groups so that people would not be in discussion groups with their bosses. We arranged for the supervisory groups to meet separately from the employee groups. This provides a free atmosphere in which the employees are not restrained and in which discussion and conversation is quite open and frank.

After a short period of uneasiness on the part of the supervisors, they learned that the employees did not "get out of hand" because of being allowed to discuss company matter freely in the absence of their supervisor.

As a matter of fact, having the employees meet apart from the supervisors proved to be a stimulus to the supervisors. The supervisors came to realize that the employees were discussing the same subject matter which the supervisors were discussing in the supervisor's meetings. The supervisors naturally wanted to master the subjects at least as well as their employees. The result was a high degree of interest and attention and participation in the supervisory groups, as well as in the employee groups.

Another beneficial result has been that the common interest in the subject matter discussed in the conferences has given the supervisors and the employees some good conversational opportunities. Frequently the subject matter of the conferences becomes also the "job conversation." This is a good thing, as the whole organization becomes interested and informed about a specific subject at approximately the same time.

Improved employee relations was an immediate and continuing benefit from this program. The conferences never have been "gripe sessions," but the conferences have provided the employees with a place where they can discuss things which they think need attention. This matter can be and is brought to the attention of the local management and the general management of the company. As a consequence, something is done to explain or to straighten out the source of any employee irritation, complaint or incipient grievance. One immediate result was and continues to be improved employee relations.

Other benefits have accrued to the company because of the higher degree of information possessed by the employees. The employees have been encouraged to discuss problems affecting the company with their families, friends, neighbors and acquaintances. As a result of the information received in the conferences, the employees have become better and more alert spokesmen for the company.

The all-employee conference setup has given us the machinery through which we can communicate to all of our employees very rapidly and effectively. When a problem arises which affects the company and on which immediate action is necessary, the conference machinery can be used to present the problem to all employees in the company within about 48 hours.

If the employees are expected to take any action, this request can be made to them in person in a conference in which the subject matter is discussed. This has proved to be an effective means of fast communication and an effective means of getting broad employee action.

Leading the conferences has come to be considered an exceptional employee privilege. The conference leaders do not want to give up their leadership. Other employees want to be trained as conference leaders.

We have found that training in conference leadership and actual practice in conducting conferences is an excellent form of management development work. The conference

(Continued on page 89)

All Employee Conference Leaders in a bi-monthly all-day meeting with R. M. Winsborough, vice-president and consultant with Middle West Service Company and Paul L. Gunn, Director of Employee Relations (second and third from left respectively in front row) to receive briefing on the next employee conference program.

ENGINEERING/OPERATIONS

Bad For Dogs—Good For Alibis

Gulf States Utilities reports that its meter readers are meeting their long-time foes—dogs—with toy water pistols full of inexpensive perfume. The perfume discourages the dogs from barking and biting with no harmful effects. Nothing was reported about meter readers' wives' reactions the first day after the water pistols were used.

Gas, Steam Turbine Team Up At Ohio Power

A generating cycle combining a steam turbine and a gas turbine, to be installed by Spring of 1961 at Ohio Power's Muskingum River Plant, will be used for the first time in the production of electric energy by a coal-burning plant.

A five-mw prototype turbine, driven by coal gas, will be built adjacent to, and will operate in combined cycle with, the plant's Unit Number 1 215-mw steam turbine. Objective of the combination cycle is added efficiency of generation. In later full-scale application of this cycle, an improvement of four per cent in overall efficiency is expected.

The five-mw prototype will operate in this manner: Coal for the gas turbine, broken down by high temperature in a carbonizer, will yield both gas and char. The gas will be burned in the gas turbine. The hot exhaust from the gas turbine will join the char in a cyclone-type burner firing into the pulverized coal-fired boiler. The char will burn and supply a portion of the steam generated for the steam turbine.

In this joint project, General Electric will supply the gas turbine and its control devices, the carbonizer and the related coal and char feeding devices. Design and construction of the installation will be carried out by American Electric Power Service Corp.

Run Indoor Motor Outdoors, Successfully

A standard indoor-type, dripproof, 500-hp, 2.3-kv induction motor equipped with Thermalastic® insulation, has operated successfully for 2½ years out-of-doors at Westinghouse's East Pittsburgh, Pa. plant.

To accelerate insulation degrading factors as much as possible, the motor has been operated under no-load conditions for 40 to 50 hours each week in an exposed area. At no-load, there is little heat generated to produce the usual drying effect. Also, the large amount of down time over week ends gives ample opportunity for severe condensation.

The motor has operated through two complete winters and has been exposed to a typical northeastern climate, including snow, sleet, rain, dust and heat. The insulation provides the only weather protection.

No indication of any pending difficulty was revealed by periodic maintenance tests, including dielectric absorption studies at various voltages and a d-c overpotential test at the six-kv level as recommended in AIEE test specifications.

Progress Advances On Project EHV

Completion of final design and foundation construction for three portal-type transmission towers for Project EHV has been announced by General Electric's Power Transformer Dept. According to Dr. P. A. Abetti, project manager, the individual towers will weigh about 100 tons, with towers one and three being dead-end towers and tower number two an angle tower. The structures, each being equipped with two 40-ft-high aluminum lightning spires, will be 162 to 184 ft wide and will range in height from 78 to 129 ft.

The unique towers are designed so that their entire weight rests on four pinned supports—two for each leg, according to G. E. Fortney, chief engineer-towers, American Bridge Div., United States Steel. This construction was selected by Stone & Webster Engineering Corp., engineers and supervisors of construction, so that the small settlement expected will not overstress the tower members. During construction, explosives were used to consolidate the loose sand—thereby providing adequate support, yet eliminating the need for expensive pilings.

Tower number one will include instrument platforms, closed-circuit television camera locations, observation catwalks, airplane warning lights and a passenger elevator.

Other Project EHV cooperators concerned with the towers are Aluminum Co. of America, Anchor Metals, Prestressed Concrete Institute, Rilco Laminated Products and the Weyerhaeuser Co.

Meanwhile, first shipment of aluminum members for what is becoming the world's largest aluminum substation was made by Alcoa in February. The aluminum components will comprise North Substation.

The substation will be flanked by two portal-type aluminum tower structures. Incoming utility power lines will reach a 42-ft-wide tower. Starting point of the experimental line is an aluminum structure, comprising 68-ft-high vertical members supporting a 123-ft span.

Electrical residential heating load will forge ahead in the future as its inherent advantages tend to put it in a better competitive position.

CHARACTERISTICS OF ELECTRIC HEATING LOADS

IN THE CLEVELAND AREA

By EDWARD D. HESSEMAN
Senior Engineer, Transmission and Distribution Department
The Cleveland Electric Illuminating Company

Study of some 1600 electric house-heating installations in the Cleveland area has produced most useful and interesting data. Only by checking characteristics of this load constantly as saturation increases can utilities meet the challenge of the future to supply this load in the most economical manner.

THE ILLUMINATING Company has made studies of electric-heating loads in its territory over the past seven years. From January to April 1952, a complete study of 32 glass-panel-heated homes was carried out and various factors were developed. In March of 1957, a study was made of eight customers four having baseboard and four having ceiling-heater installations. This study verified that the factors developed in the 1951-52 study are valid for any type of resistance heating and particularly that there is no significant difference in kwh consumption values for radiant and convection heating.

Other load studies have developed characteristics of customers who have ranges, dryers, and water heaters in addition to their base load, but with no panel heating.

Thirteen all-electric homes were metered in January and February of 1958. These homes were all similar in size and construction, and all contained seven or eight thermostat-controlled heating panels, plus two uncontrolled panels in the bathroom. All of the homes metered contained 40-gallon electric water heaters and most had electric ranges and dryers.

Growth of electric heating load in the area has been slow but steady from 1950 to the present time. However, in the latter part of 1957 we received an order to supply 125 electrically heated homes in one development called Paradise Valley where natural gas was not available. Since then we have received orders for home heating in suburban areas for smaller real-estate developments. We have studied most of these installations in hopes of solving such problems as distribution design, desirability of sales promotion, and adequacy of rates.

Energy Consumption

Energy consumption of electric heating installations varies with size of house, outside temperature, and inside, or thermostat temperature. Most convenient measure of consumption is kilowatthours per degree-day per 1000 cubic feet. This eliminates effect of size of house and different temperature periods in comparing heating performance.

Degree-days per day is found by averaging highest and lowest temperatures for the day and subtracting this average from 65 degrees.

Sum of these degree-days per day over a year gives a measure of severity of the heating season. Average heating season in the Cleveland area is approximately 6000 degree days.

Glass-panel-heating homes in the Cleveland area had an average of 0.28 kwh/dd/1000 cubic feet. The homes studied ranged from 0.17 to 0.41 kwh/dd/1000 cubic feet, according to quality of insulation, customer-use habits, thermostat setting, and other factors which cannot be determined accurately. Results of the 1957 study of eight baseboard- and ceiling-cable customers fell well within this range; close to the average.

On a seasonal basis, this amounts to an average use of 1,680 kwh season/1000 cubic feet with a range from 1,020 to 2,460.

Average home in the panel-heating study had a volume of 6,350 cubic feet, and, therefore, a consumption of about 11,000 kwh for the heating season. Under the present CEI rates, this would cost the residential customer roughly $187.00 for electric heating for an average season.

Metering in the Paradise Valley study was such that heating load could not be separated from rest of the use. However, the homes were about the same size as those metered in the glass-panel study, and indications are that heating use was comparable.

Load Shapes

Average daily load curves for panel heating alone as shown in Fig. 1 tend to follow temperature variations during the day, with a time lag of roughly two hours. Superimposed upon this pattern is a morning peak between 6 and 8 am and a second peak between 7 and 9 pm which amounts to 70 to 90 per cent of the morning peak. These morning and evening peaks may be explained partially by customers increasing their thermostat settings manually, and resulting high use of panel heating to satisfy the demand for more heat.

Average load shape for a customer having all major appliances except panel heat looks like the one shown in Fig. 2. Expected load pattern for an all-electric house can be found by adding this curve to that of Fig. 1 for panel heating which results in the curve for combined loads shown in Fig. 3.

Actually, the average load shape for 13 Paradise Valley customers on the coldest day had the pattern average shown in Fig. 4. This load was recorded on February 17, 1958, a Monday, and there may have been a large dryer load on at the time of the peak. In addition, 13 homes is an inadequate sample from a statistical viewpoint.

But patterns of this type cannot be applied with any accuracy to an individual home, only to a group. Load shape for an individual home, even during a single day shows tremendous variations from reading to reading, and is also quite different from the average curve. Fig. 5 shows such a curve for a single home.

Load Factors

Individual monthly load factor during the heating season for resistance heating load ranged from 20 to 65 per cent with average of individual monthly load factors being 38 per cent. Annual load factor for individual panel-heating customers ranged from 16 per cent to 30 per cent, the average being 20 per cent. These individual load factors compared very favorably with the corresponding load factor for all-electric homes without panel heating.

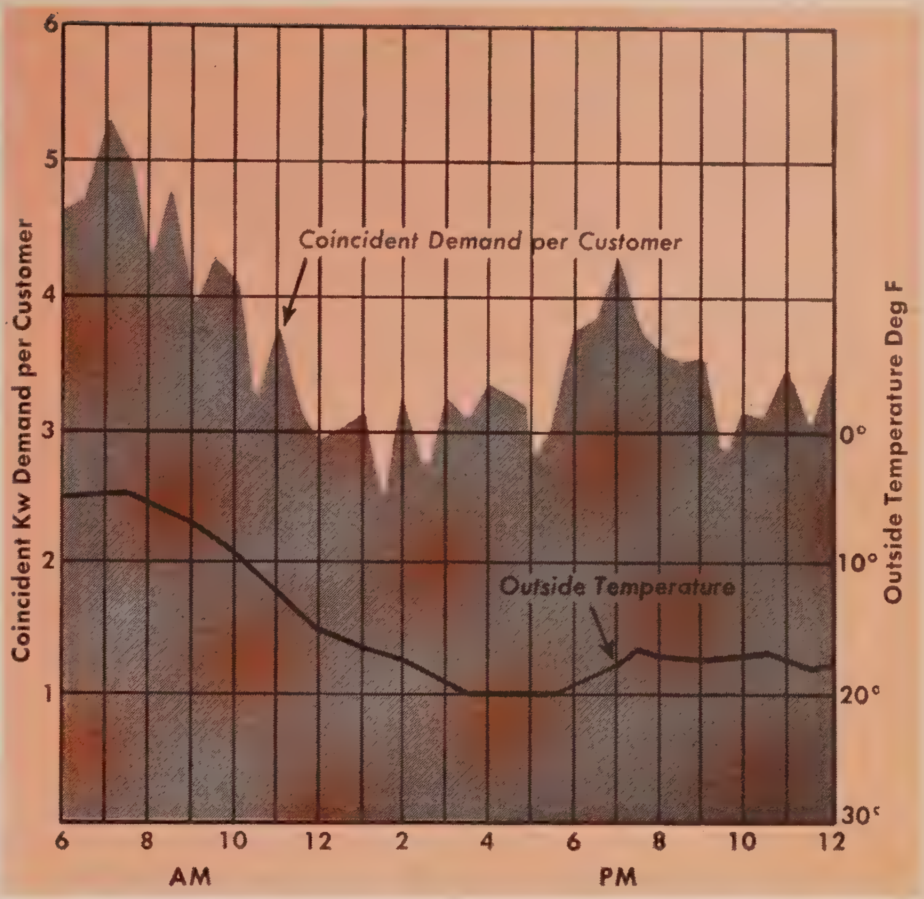
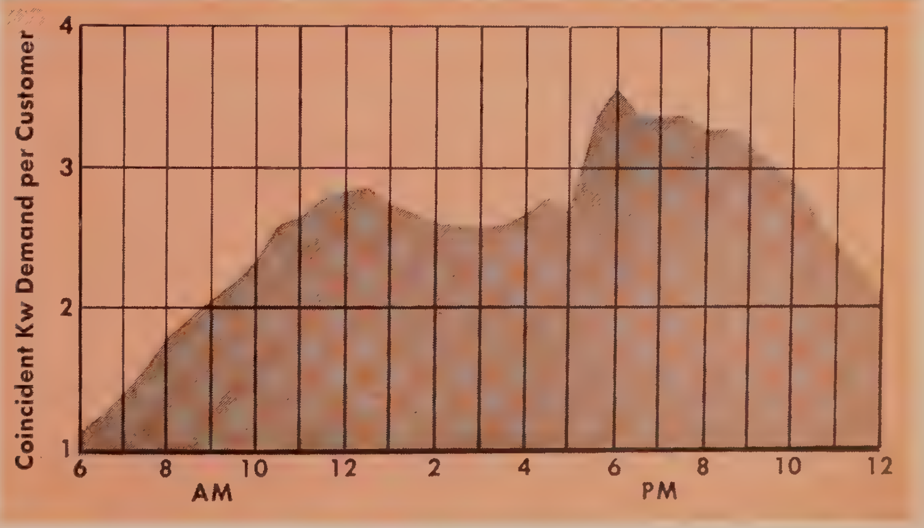


Fig. 1—Coincident demand per customer of a group of customers with panel heating load only on a typical maximum-heating winter weekday.

The story is quite different, however, when annual group load factors are compared. Although the average individual all-electric customer without panel heating may have an annual load factor between 10 per cent and 20 per cent, the group annual load factor for these customers is about 40 per cent. But with electrically-heated homes with an average individual annual load factor of 20 per cent, the annual group load factor is only about 25 per cent. This shows that inter-customer diversity is less for panel-heating customers than for all-electric homes without panel heating.

Since the Paradise Valley development was a recent one, at the time of study no annual or seasonal usage was available for load-factor calculations. However, during a recent one-week period we metered the entire load in this development with primary metering equipment. Maximum 15-minute demand was

Fig. 2—Coincident demand per customer of a group of customers without electric heating but with electric ranges, dryers, and water heaters on probably what is the same type of winter day as is shown in Fig. 1.



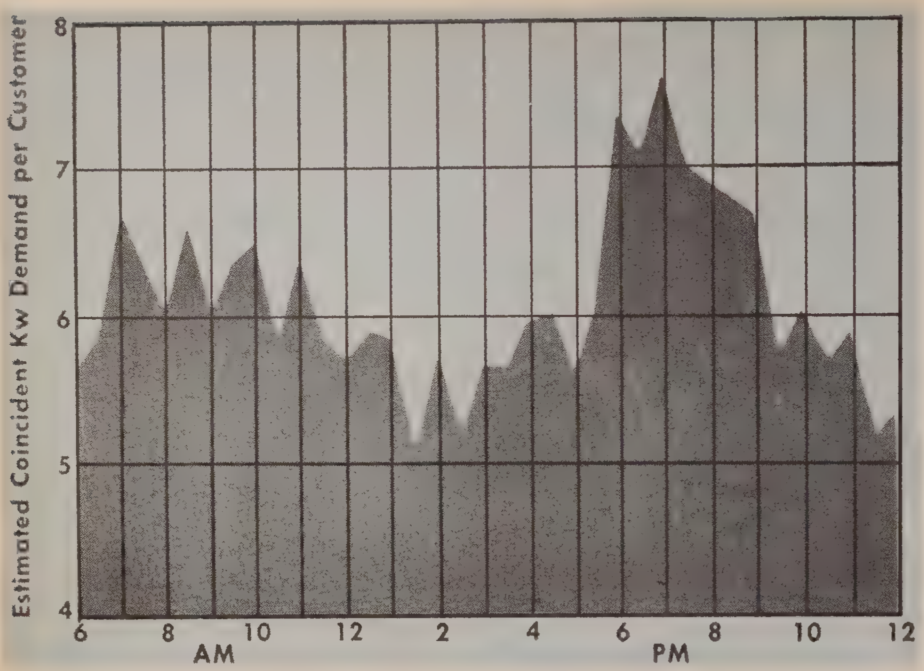


Fig. 3—This estimated shape of load curve is a combination of the curves in Figs. 1 and 2 to show how load would vary per customer for a group of all-electric homes.

600 kw and minimum demand was 275 kw with an average value of 475, showing a load factor of 79 per cent. Average temperature during this period was 27°, with a maximum of 46°, and a minimum of −1°. This high load factor shows the close relationship between kwh consumption and outside temperature conditions.

Diversity Factors

On coldest days, full diversity of panel heat alone is obtained with eight to ten resistance-heating customers. Diversity factor for such a group was found to be about 1.1. This lack of diversity is compensated by fall of peak demands in the early morning, and through some diversity with the rest of the system. Also peak load for panel heating will fall on the coldest day of the year, which is normally not the day of the system peak.

On warmer days, full diversity of panel heat alone is obtained with about 15 customers and the diversity factor may be as good as 1.8. Total customer load shape will still reflect the heating use, but an evening maximum may develop. This is not critical because the demand is much less than in the case of the coldest day.

A diversity-versus-number-of-customers curve was drawn up for the Paradise Valley Study as shown in Fig. 6. This shows that for all-electric homes, full diversity will be reached with about 12 to 15 customers, at a value of about 1.8.

Insulation

A home must be well insulated for most effective use of electric heat. Manufacturers recommend three to four inches of insulation in walls and ceilings. A frame wall with 3⅝ in. of fill-type insulation will be the equivalent of five solid brick walls 8 in. thick each which are not insulated. Storm windows and doors are a must, as well as insulation under cold floors. A house without storm windows and doors, and an uninsulated floor, will have about 50 per cent more kwh consumption than if it were fully insulated.

Heat Pumps

Heat pumps tend to have a lower consumption per cubic foot of heated space than resistance heating. They consume an average of 0.13 kwh/dd/1000 cubic feet (compared to a factor of 0.21 for fully-insulated resistance-heated homes)

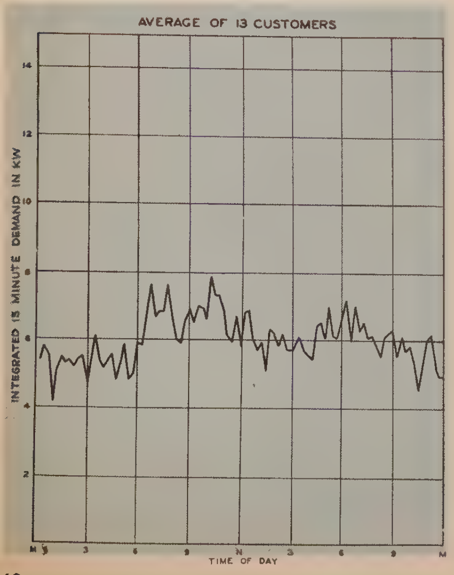
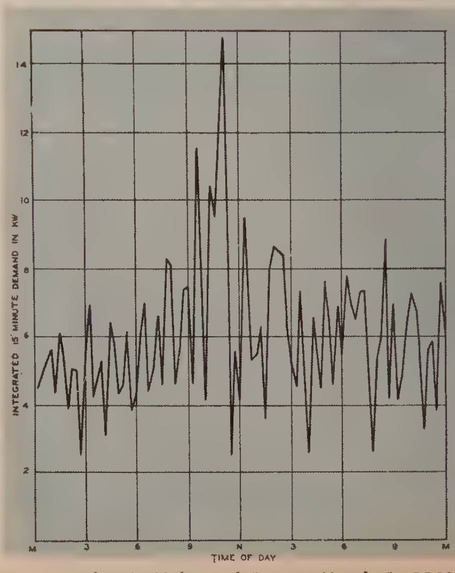


Fig. 4—Actual average load shape for 13 customers with electric panel heating on the coldest day of the winter of 1957-1958 is shown here. This may include electric dryers as well as heating and appliances.

Fig. 5—Demand shown here on a single home with resistance heating fluctuates widely as compared with demand of the group as shown in Fig. 4.



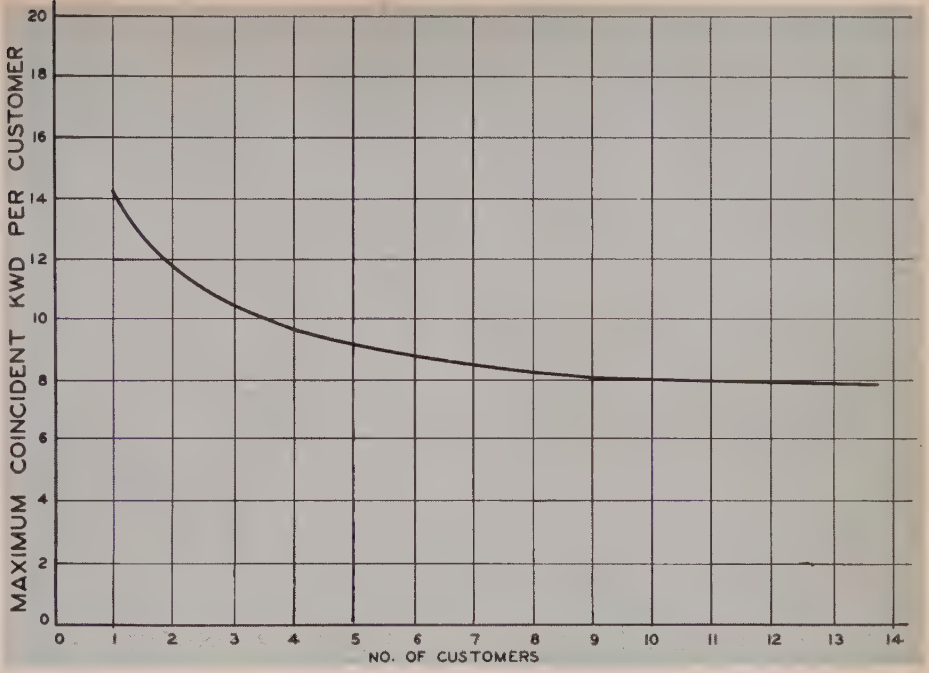


Fig. 6—Maximum coincident demand per customer decreases markedly as number of customers in group increases.

and the 18 homes measured range from 0.096 to 0.248 kwh/dd/1000 cubic feet.

Seasonal consumption in the Cleveland Electric area ranged from 577 to 1048 kwh/1000 cubic feet with an average of 828 kwh/1000 cubic feet. Average size of the homes studied was 23,700 cubic feet, almost four times size of the average panel-heating house, and the average annual energy consumption was 19,600 kilowatthours.

The average individual annual load factor was 13.6 per cent which compares to the average annual load factor from the Electric Space Heating and Air Conditioning Report of 1956. Range of annual individual load factors for the 18 Cleveland Electric Illuminating heat-pump installations measured was from 9.3 per cent to 21.1 per cent. This was lower than individual load factor of the panel-heated homes despite the fact that these heat pumps used energy for air conditioning. Reason for this is due to the large amount of auxiliary resistance heating used on the Cleveland installations. When the thermostat is set up, the panel heating tends to try to pick up the temperature first, because it is quicker than the heat-pump cycle. Also, when the heat pump is operating during a cold day, the evaporator coils tend to freeze up, and the heat-pump cycle is reversed, to thaw them. During this time, the house is receiving no heat from the heat pump, and the panel heat units come on to provide for this lack. Several homes had these supplemental heating panels disconnected and showed a marked improvement in annual load factor.

Conclusion

According to even the most tempered sales predictions, residential heating load will forge ahead in the near future, as its inherent advantages tend to put it in a better competitive position. In line with this anticipated growth we must constantly check impact of this load on our system as the saturation increases. Only by closely following electrical characteristics of this load, will we be able to meet the challenge of the future to supply this load growth in the most economic manner.

Acknowledgment is hereby given C. T. Loshing and C. C. Chopp of our technical studies section and J. R. Lushbaugh of residential sales for their able assistance in preparation of data.

Characteristics of Electric-Heating Loads

Panel-heating load characteristics	
Average Heated Space	6,250 Cu Ft
Rated Capacity of Heating Load	7.9 Kw
Annual Use for Heating	10,500 Kwh
Non-Coincident Maximum Load	6.3 Kw
Individual Annual Load Factor	19.0%
Group Coincident Maximum Load	5.3 Kw
Group Annual Load Factor	22.6
Group Diversity Factor	1.19
Normal Annual Degree Days	6,000

Estimated Annual Load Characteristics of the All-Electric Home	
Average Individual Maximum Demand	12.7 Kw
Average Annual Use	23,000 Kwh
Average Annual Individual Load Factor	20.7%
Group Coincident Maximum Demand	7.6 Kw
Average Group Annual Load Factor	34.6%
Group Diversity Factor	1.67

FISH-BYPASS EXPERIENCE AT PGE's NEW HYDRO PROJECTS

Operating experience in by-passing fish at Portland General Electric's new North Fork and Pelton hydroelectric projects now permits comparative evaluation of the two different systems in use.

By GEORGE J. EICHER,
Aquatic Biologist
Portland General Electric Company

THE MOST DISCUSSED single feature of proposed high dams in the paths of anadromous fish is the artificial outlet or "skimmer," as it is sometimes called.

Artificial outlets proved at Portland General Electric's new North Fork and Pelton hydroelectric projects are of different types and the company has now had sufficient experience with them to judge of their relative merits.

General descriptions of the artificial outlets employed at these two projects, also authored by the writer, were published in previous issues of EL&P as follows:

"PGE Pioneers New Approach to Fish Passage at Pelton Project"
March 15, 1958—Page 56
"Fish Get Novel Treatment at PGE's North Fork Project"
April 15, 1958—Page 84

PGE's Pelton Project is located on the Deschutes River in central Oregon, and the North Fork Project is on the Clackamas River in central Oregon.

Basic Considerations

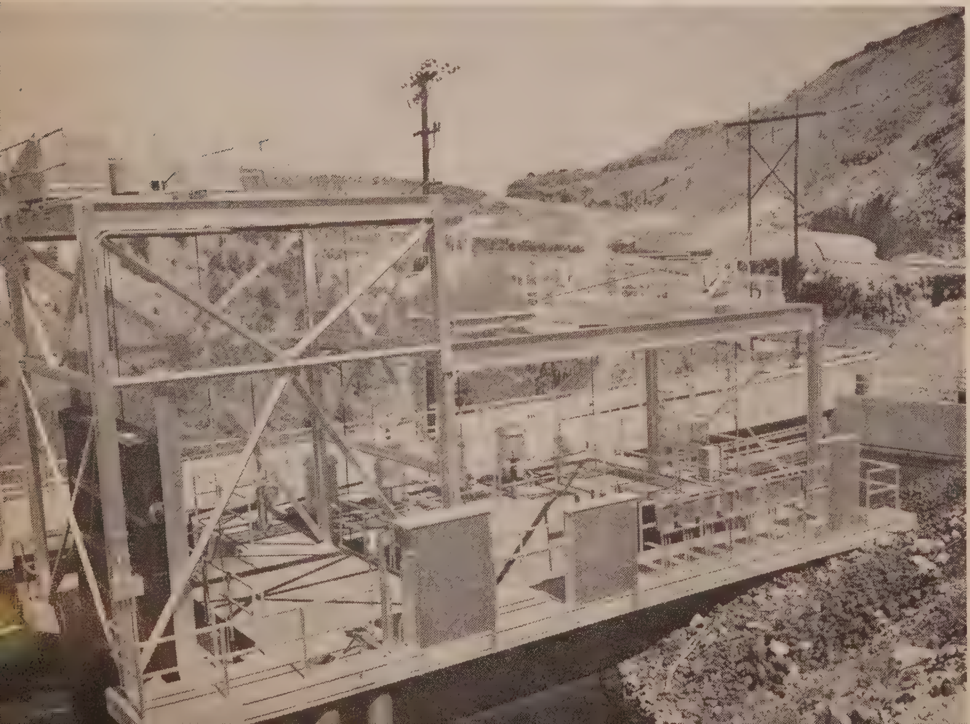
There is no real difficulty in moving adult salmon and steelhead upstream over dams of any height presently proposed or built. In spite of the furor over the height of some dams being projected for salmon streams, biologists are not too concerned about this. Proven means exist to move the fish once they are taken into a good entrance system.

The reverse is in the main true of downstream-migrant fish, the young salmon and steelhead trout on their way to sea. Once they are collected from a reservoir there is no particular difficulty involved in speeding them on their way. The greatest concern of fish experts has been in getting the small fish to enter the collection systems. In certain respects the high-head dam is more attractive to the biologist concerned with protection of downstream migrants than is the low-head, run-of-the-river plant. In the latter, surface currents are such that it is virtually certain that the bulk of the fish will pass through the turbines with varying degrees of survival.

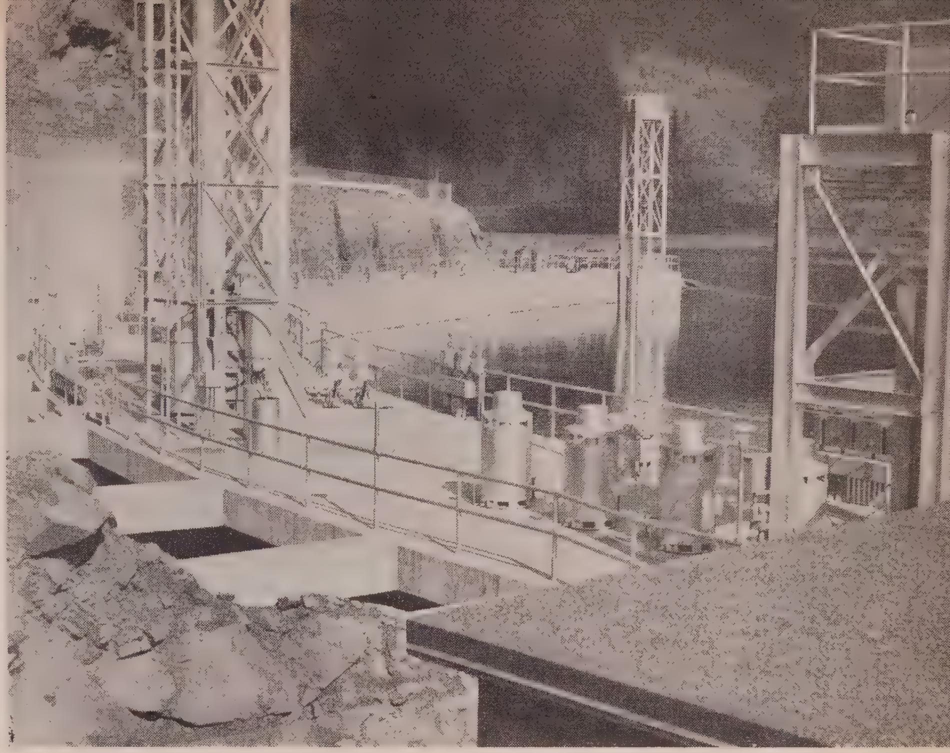
It has been determined experimentally, however, that the fish travel normally in the top 20 feet of a reservoir unless denied means of egress, and furthermore that very few will reach the turbines in any case if the penstock entrances are submerged over 130 feet. It has also been found that spillways can be designed so that fish losses will not occur at any height of spill. It is possible, then, to so design a project that the fish will either leave by the means provided for them or not at all. The facility usually proposed for such dams has been the artificial outlet, or "skimmer."

How The "Skimmer" Functions

In such a device, a large flow of water at the surface is induced out of the reservoir in a strategic location by means of pumps so as to simulate a natural outlet. Before



Pelton artificial outlet, or "skimmer," first prototype of its kind.



North Fork combination structure which includes the artificial outlet. The four pumps may be seen in the foreground. Screens are just beyond superstructure at left. Entrance gate is below superstructure in right center.

the water containing fish reaches the pumps, however, it passes through a screen which diverts a fraction of it and the fish into a by-pass which carries them to tailwater. The pumped flow is returned to the reservoir for generation.

Rather different types of artificial outlets are in use at the two PGE projects. Both employ flows of 200 cubic feet per second moved by four pumps. Both use entrance gates to develop velocities sufficient to largely preclude the possibility of the fish returning to the reservoir after entering the structures. The similarity ends at this point.

In the case of the Pelton "skimmer," the fish pass through a pool in back of the entrance gate, then go over what is known as an "inclined-plane screen." Such devices have been long employed by fish biologists to trap downstream migrants in fast-moving streams. Since most of the water falls through the screen of such a trap, whereas only a fraction containing the fish goes over the end and falls into the collection chamber, the fish are not beaten by the current and injured. In adapting this principle to the artificial outlet, the water falling through the screen is returned to the reservoir through pumps while that going over the end falls into a sump from which the fish are carried continuously into the by-pass.

Water flows through a pool after passing over the entrance gate in the case of the North Fork outlet also. Below this point it encounters a vertical screen set at an angle of 20 degrees to the flow. The channel is narrowed by the angling of the screen towards one wall and finally ends in an opening one foot in width through which the fish pass. This passage brings them to a chamber where a small flow carries them over a gate and into the by-pass. As at Pelton, the bulk of the flow passes through the screen and is pumped back into the reservoir.

Comparative Analysis

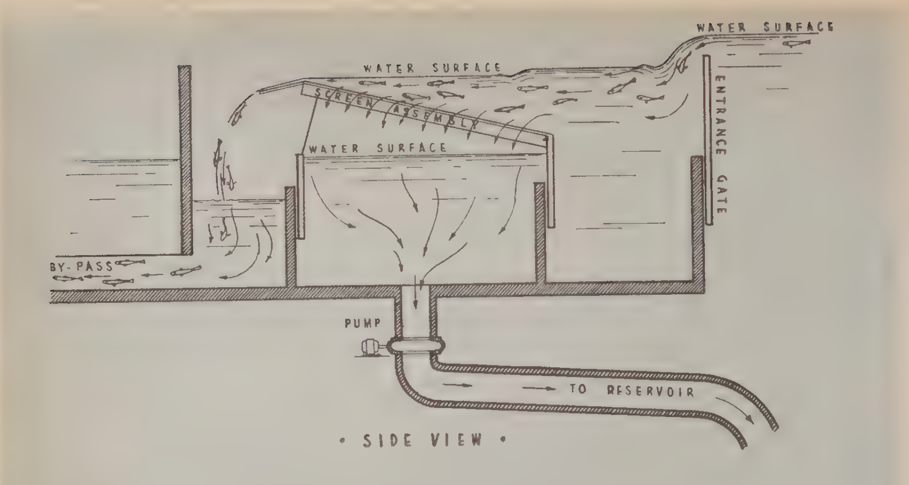
It is the purpose of this article to compare the engineering and maintenance features of these two systems. Both are presently passing numbers of downstream-migrant fish, although the percentages of the total out-migrations passed will not be known for some time. PGE is currently engaged in a research project in cooperation with interested fish agencies to evaluate the Pelton fish facilities with particular emphasis on the artificial outlet.

In the case of the Pelton structure, three large and one small gates are involved. (See illustration of principle of operation). These include the large entrance gate over which the entire flow passes into the "skimmer." It is automatically controlled by a Minneapolis-Honeywell control with an anti-hunting regulator so that it maintains a constant relationship with forebay level. A large gate under each end of the inclined-plane screen confines the water in the sump from which the pumps draw. These, as well as the screen itself, are also automatically controlled in a similar manner as the entrance gate to maintain a constant relationship to forebay level. In the sump at the entrance of the by-pass is a gate that automatically closes in case of pump failure to prevent flooding of the by-pass.

Water does not pass freely through the screen but is confined in compartments immediately underneath from which it falls through openings in baffles to the sump below. This is to promote an even velocity and level along the top of the screen. Because of the slope of the screen there is greater head on the more-submerged upstream end than there is at the hump, where only a few inches of water are present. The baffling compensates for this head difference by providing proportionately lesser passage area where the head is greater.

In operation it is necessary by trial and error to adjust the amount of free area in the baffles so that an amount falls through the screen equal to the quantity displaced by the pumps. A by-pass gate valve was added to the structure to return a portion of the displaced water back to the intake, or sump, side and thus allow a greater tolerance of disparity between pump and screen flow. The matching is still fairly critical, however. If the quantity of water falling through the screen is greater than the pump displacement, then the excess falls over the downstream gate and floods the by-pass. Should the screen flow fall below that which the pumps will move, the sump is drawn down rapidly to the point where the head on the pumps exceeds their design load and they are stopped by overload switches. To complicate the matter, the elevation of the screen must be controlled fairly precisely in order to maintain both the proper quantity of water over the end and the

(Continued on next page)



PRINCIPLE OF OPERATION
PELTON TYPE ARTIFICIAL OUTLET

proper head on the baffles.

The North Fork outlet is far less critical. The pumps simply draw down the area downstream of the screen so that the water tends to flow there to replace it. The only consequence of one, two, or three pumps stopping is a reduced flow over the entrance gate. The structure will actually still continue to operate on the by-pass flow of approximately 10 c.f.s. if all four pumps are halted, although the effectiveness is of course greatly reduced.

In essence only two gates are used in the North Fork Outlet. One of these is the large entrance gate, automatically controlled, which maintains a constant level in the pool behind it through a 19-ft range of forebay fluctuation. A small gate, also automatic, is situated at the end of the line of screens and serves to pass a constant quantity of by-pass flow.

Pumping Requirements Differ

The pumped flows of the two structures are 200 c.f.s. in both cases; however the pumping requirements differ greatly because of the characteristics of the installations. In the Pelton "skimmer" a fairly high head is compounded by the flow requirements at three points. Approximately six inches of head is maintained on the entrance gate. The head produced by the screen is governed by the slope of that structure and is the product of the thickness of the screen and baffle area plus the difference in elevation between that of the low upstream end, plus the depth of water over the hump, plus the elevation of the low end of the baffle system above the water surface in the sump below. In addition there is the head required to return the water to the depths of the reservoir through the seven-foot diameter pipe. This is in the neighborhood of six inches.

In the final analysis, the head pumped against is the difference in elevation between the water surface below the screen structure and the water surface developed above the intake to the return-flow pipe. In the case of the Pelton "skimmer" this can vary between six and nine feet depending upon the slope of the screen. To operate through this range requires four pumps of 75 hp each, or 300 hp.

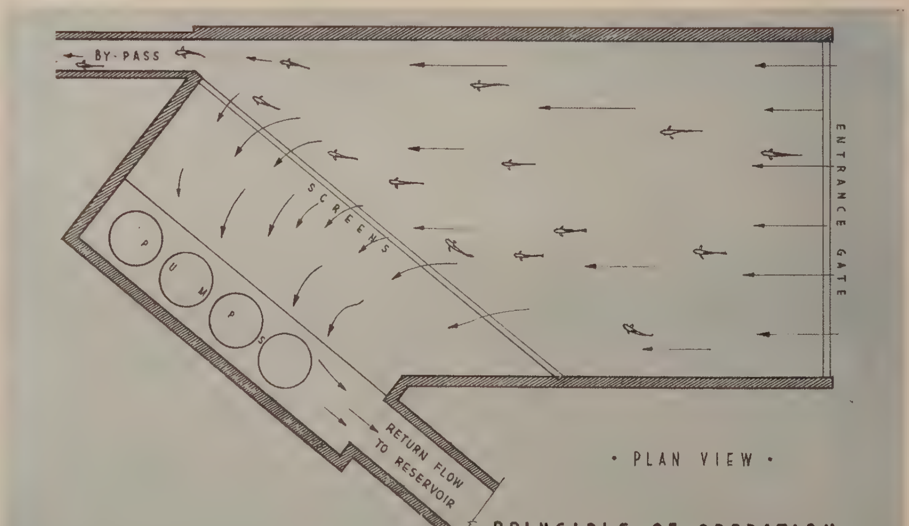
The North Fork artificial outlet does not require such high heads. The total here is the accumulation of that on the entrance gate, which ranges from 3″ to 1′3″, plus that on the screens, which ranges from one to three inches depending upon the degree of clogging (the screens automatically clean themselves when three inches of head develops), plus the head required to return the pumped flow through the 7-ft pipe, which is in the neighborhood of six inches as in the case at Pelton. The sum total is the difference in elevation between that of the water surface downstream of the screens and that developed above the intake of the return-flow pipe. It can range roughly from ten inches to two feet. Four pumps of forty hp each, or a total of 160 hp adequately handle the load.

Maintenance Differs Markedly

The maintenance problem, particularly that of keeping the screens and passageways clear of debris, differs quite markedly at the two installations. In the case of larger floating pieces, such as small logs and bits of branches, all of such material entering the Pelton facility is carried down over the screen into the sump at the head of the by-pass. This sump must be entered at intervals by a man who throws out the debris.

In the case of the North Fork structure, the floating material comes in contact with the vertical screens which tend to carry most of it over them into a trash container. A small portion goes into the by-pass sump from which it must be removed by hand. Algae is a prob-

(Continued on page 88)



PRINCIPLE OF OPERATION
NORTH FORK TYPE ARTIFICIAL OUTLET

SAG COMPUTATIONS BY TWO SLIDE RULES

By ROBERT H. CUMMING
Assistant Engineer
New England Electric System

Two slide rules used simultaneously provide a method for solving sag problems quickly and accurately.

SAG PROBLEMS can be solved by the parabola method rapidly and effectively on two slide rules. Successive corrections on first one rule and then on the other give results required. Accuracy obtained by this slide-rule method is better than can be obtained by plotting intersecting curves.

Method Based On Parabolic Curve

Parabolic solution of sags is an approximate but approved method in which it is assumed that the suspended cable takes the shape of a parabola instead of a catenary. This method will be discussed only in a general way but those interested in an excellent text on this subject are referred to "Transmission Lines, Design, Construction, and Performance," a book by Fred C. DeWeese and published by McGraw-Hill Book Company, Inc.

Basis of the parabolic solution is a study of the difference between straight-line span length and parabolic-curve length under various conditions. This difference is expressed by the equation,

$$\triangle = \frac{8d^2}{3L_s}, \tag{1}$$

where

$\triangle$ = difference between straight-line and parabolic-curve length

d = sag of the conductor in ft, and

L_S = span length in ft.

Approach using this method is to determine what effect loading and temperature cycles will have on the sag and tension.

First step is to assume that at a given temperature all tension is removed from the conductor while still in place, which, in turn, removes all stretch. This unstressed, unstretched conductor length is generally referred to as L_U.

Tension is now assumed to be reapplied in convenient increments of, say, 200 lb. Resulting stretch *e* at any of these tensions is,

$$e = \frac{HL_u}{EA} \tag{2}$$

where

H = tension in pounds

E = modulus of elasticity, and

A = cross-sectional area of a conductor.

Result in each case is that as stretch increases, $\triangle$, and hence sag, increases.

We now have a sag corresponding to each increment of tension and if these sags are plotted against corresponding tensions, points will take the shape of a smooth curve at the temperature assumed such as the one labeled 0°F in Fig. 1.

However this 0° curve applies to only one temperature and similar curves must be derived for other temperatures. Expansion or contraction *t* of a conductor caused by a change in temperature is equal to

$$t = CL_uT \tag{3}$$

where

C = coefficient of expansion,

L_u = unstressed length of conductor at initial temperature, and

T = increment of temperature change in degrees F.

These increments of expansion or contraction due to temperature changes are in addition to changes in length caused by stretch at various tensions. Reintegrating these values in terms of sag as before produces one curve for each temperature under investigation.

Intersection of two simultaneous equations used to define sag and tension of a transmission conductor can be done using two slide rules. Successive settings on the two rules are indicated here for this illustration by marks pasted on the rules themselves.

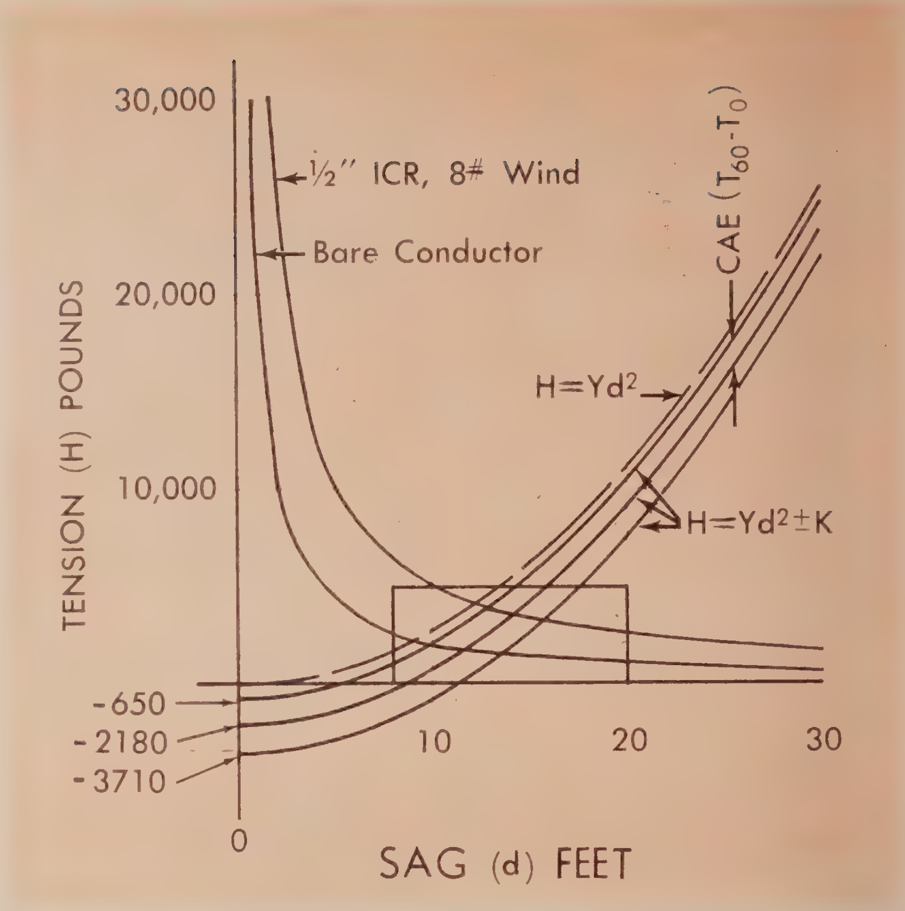


Fig. 1—Sags are plotted against tensions here for conductors under various conditions of loading and temperatures. Intersections of curves with negative slope with curves of positive slope give solutions.

However, these curves for various temperatures have no real meaning until they are intersected by another set of loading curves. These are simply plots of the equation of a parabola with the equation

$$H = \frac{WL_s^2}{8d} \qquad (4)$$

where W is a constant for one curve such as of bare conductors and is a different constant for other loading conditions such as ice and/or wind on conductors or external load such as a cable on a messenger. Sag and tension are then usually scaled off intersections of these curves.

Deriving Equation For Slide-Rule Use

Equation of the temperature curve is derived from equation (1) by expressing sag in terms of $\triangle_I$,

$$d_I^2 = \frac{3L_s\triangle_I}{8} \qquad (5)$$

But since $\triangle_I$ is altered by increments of tension and temperature, $\frac{L_u(H - H_I)}{AE}$ and $CL_u(T_F - T_I)$ respectively, equation (5) becomes:

$$d^2 = \frac{3L_s}{8}\left[\triangle_I + \frac{L_u(H - H_I)}{AE} + CL_u(T_F - T_I)\right].$$

Multiplying through by $(\frac{3L_s}{8})$ and rearranging, this equation becomes,

$$d^2 - \frac{3L_s}{8}\triangle_I = \frac{3L_sL_u(H - H_I)}{8AE} + \frac{3L_sL_uC(T_F - T_I)}{8}\;\frac{AE}{AE}$$

Substituting d_I^2 for its equivalent from equation (5) and simplifying,

$$\frac{8AE}{3L_sL_u}(d^2 - d_I^2) = (H - H_I) + CAE(T_F - T_I),$$

and solving for H by rearranging,

$$H = \left(\frac{8AE}{3L_sL_u}\right)(d^2) - \left(\frac{8AE}{3L_sL_u}\right)(d_I^2) + H_I - CAE(T_F - T_I) \qquad (6)$$

Since H and d are the only unknowns in equation (6), this expression reduces to:

$$H = Yd^2 \pm K \qquad (6a)$$

where Y stands for $\frac{8AE}{3L_sL_u}$ and K is a different constant for each temperature.

Example

The method for two slide rules can be demonstrated now to solve a practical example. Let us assume that we have a 500-ft span of 4/0, seven-strand copper conductor. Maximum tension is to be 400 lb under heavy-loading conditions of ½-in. radial ice and 8-lb wind at 0F. Sags and tensions are required for conditions of 60F and 120F.

The following data is given:

L_s = span length = 500 ft

W_b = Weight of bare conductor = 0.653 lb/ft

W_c = weight of conductor under design heavy loading = 1.635 lb/ft

A = cross-sectional area of conductor = 0.1662 in.²

C = temperature coefficient of expansion per degree F = 9.6 × 10^{-6}

E = modulus of elasticity = 16 × 10^6

H_I = initial tension = 4000 lb

Calculation Of Initial Conditions

$$d_I = \text{initial sag} = \frac{W_cL_s^2}{8H_I} = \frac{1.635 \times \overline{500}^2}{8 \times 4000} = 12.77 \text{ ft.}$$

Tension H of conductor carrying only its own weight with no ice or wind loading in terms of sag d is determined from equation (4),

$$H = \frac{W_b \times L_s^2}{8d} = \frac{0.653 \times \overline{500}^2}{8d} = \frac{20{,}400}{d}$$

and $Hd = 20{,}400$.

Difference $\triangle_I$ between parabolic length of conductor and span length at initial heavy-loading conditions is determined using equation (1) as follows:

$$\triangle_I = \frac{8d_I^2}{3L_s} = \frac{8 \times \overline{12.77}^2}{3 \times 500} = 0.870 \text{ ft.}$$

Length of parabola L_p from definition is,

$$L_p = L_s + \triangle_I = 500 + 0.870 = 500.870 \text{ ft.}$$

and unstressed length L_u can be obtained by adapting equation (2) to the form,

$$L_u = \frac{L_p}{1 + \frac{H_I}{EA}} = \frac{500.870}{1 + \frac{4000}{(16 \times 10^6)(0.1662)}} = 500.118.$$

Evaluating components of equations (6) and (6a),

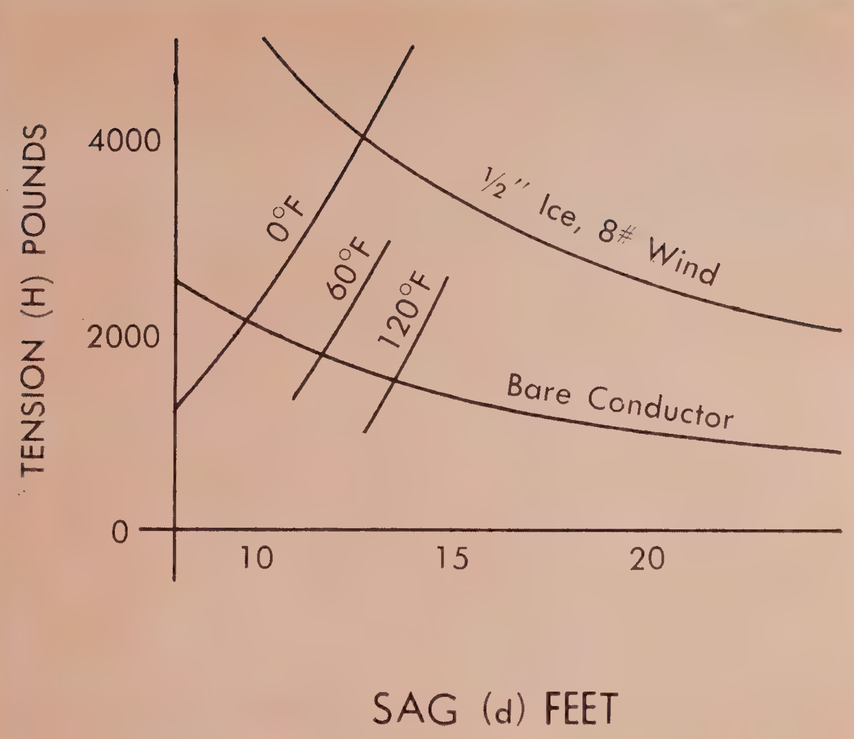


Fig. 2—The curves of Fig. 1 look like this when magnified to readable values.

$$Y = \frac{8AE}{3L_sL_u} = \frac{8 \times 0.1662 \times 16 \times 10^6}{3 \times 500 \times 500.118} = 28.36$$

$$\text{and } K = \frac{(8AE)}{(3L_sL_u)}(d_I^2) + H_I - CAE\,(T_F - T_I)$$
$$= -(28.36)\ (12.77^2) + 4000 - 9.6 \times 10^{-6} \times 0.1662 \times 16 \times 10^6 \times (T_F - T_I)$$
$$= -4630 + 4000 - 25.5\ (T_F - T_I)$$
$$K_{0^\circ} = -630 - 25.5\ (0-0) = -630$$
$$K_{60^\circ} = -630 - 25.5\ (60 - 0) = -2160$$
$$K_{120^\circ} = -630 - 25.5\ (120 - 0) = -3690$$
$$\text{and } H_{0^\circ} = 28.36d^2 - 630$$
$$H_{60^\circ} = 28.36d^2 - 2160$$
$$H_{120^\circ} = 28.36d^2 - 3690.$$

But also equation for tension *H* is,

$$H = \frac{20{,}400}{d}$$

from equation (4) for various sags *d*. Hence we have two equations with two unknowns, *H* and *d*. Solution of these simultaneous equations is very difficult because of the constant, *K* in equation (6a).

However, this difficulty is overcome through a series of successive approximations by setting one of these equations on one slide rule and the other equation on a second slide rule. Alternating settings, first on one rule and then on the other until the equations converge, their intersection provides the answer.

Setting The Slide Rules

The first slide rule (SR-1) is set up to evaluate the Yd^2 portion of equation (6a) as a measure of tensions for various sags *d*. *Y* has been found previously to be equal to 28.36 for this problem. Setting index of the *C* scale on SR-1 to 28.36 on the *A* scale makes it possible to read product of *Y* and d^2 on scale *A* under hairline of runner for any assumed value of sag *d* to which hairline may be set on scale *C*. It should be remembered that equation (6a) includes a constant *K* which must be added to all values obtained on scale *A* by these settings in order to obtain true tensions for sags assumed.

The second slide rule (SR-2) is set to equation (4),

$$H = \frac{20{,}400}{d}.$$

Since two of the three values in equation (4) are unknown it is helpful to assume some reasonable value for *H*, say 2000 lb in this example, which determines *d*. In this case and with this assumption *d* would be 10.2 ft. Computation of these values helps to check decimal points and to catch errors.

Here it is convenient to think of equation (4) in the following form for setting up on SR-2:

$$20{,}400 = dH = \frac{d}{\frac{1}{H}} = \frac{10.2}{\frac{1}{2000}}.$$

Index of *C* scale of SR-2 is set to 20,400 on the *D* scale. It will be noticed that 2000 lb (tension) on the *CI* scale comes opposite 10.2 ft (sag) on the *D* scale. Arrangement is such that tension for any assumed sag to which the hairline is set on scale *D* is found under the hairline on scale *CI*. These settings between slides and bodies on the two slide rules remain fixed for all calculations of sags and tensions of the bare conductor without ice or wind loading of this problem and only the runners need be moved for new calculations.

Trial Settings

First trial setting should be made rather extreme so that corrections will be on one side only of the correct value. Successive settings should then be made judiciously and trend of corrections noted. This procedure results in much quicker solutions than are possible by trying to estimate final setting immediately and then see-sawing around it which can only result in lucky solutions rather than skillful ones.

Let us therefore assume as a very rough assumption for the zero-degree condition that $Yd^2 = 630$. This makes H_{0° equal to zero since

$$H_{0^\circ} = Yd^2 - 630.$$

Moving the hairline of SR-1 to 630 on scale *A* gives sag of 4.7 ft on scale *C*.

Now that a 4.7-ft sag has been determined as a first trial and its corresponding tension is known to be 630 lb, tension for the same sag is calculated by the second equation on SR-2. Moving the hairline of SR-1 to 4.7 on scale *D*, tension of 4300 lb is read on scale *CI*.

These values have been recorded on the first line of Table I together with a fifth column showing difference between tensions as calculated by the two equations. It should be remembered that equation (6a) used for setting SR-1 includes a constant, –630 lb, which cannot be included in the slide-rule computations but is allowed for in Column 6 in Table I. Size of differences in tensions shown in Column 6 indicate how far we are from a solution of these simultaneous equations and trend of changes in these differences shows whether or not revisions of assumptions of sag are in the right direction.

Table I

Slide-Rule Settings And Results for Conditions of Bare Conductor at 0F

Trial Setting No. (1)	Sags (ft) Settings On SR-1 (Scale C) and SR-2 (Scale D) (2)	Tensions (lb) SR-1 Reading On Scale A (3)	SR-2 Reading On Scale CI (4)	Differences (3)-(4) (5)	Differences (5)+K (K=—630) (6)
1	4.7	630	4300	—3670	—4300
2	6.0	1020	3400	—2380	—3010
3	7.0	1390	2900	—1510	—2140
4	8.0	1820	2550	— 730	—1360
5	9.0	2290	2270	+ 20	— 610
6	10.0	2840	2040	+ 800	+ 170
7	9.6	2600	2130	+ 470	— 160
8	9.7	2660	2100	+ 560	— 70
Final	9.78	2710	2080	+ 630	00

Table II

Slide-Rule Settings And Results For Conditions of Bare Conductor at 60F

	SR-2			SR-1	
	Tension		Sag	Sag	Tension
Trial Setting	(H) (Scale CI)	(H)+2160	(d) (Scale D)	(d) (Scale C)	(Yd^2) (Scale A)
1	2040	4200	10.0	10.0	2840
2	2000	4160	10.2	10.2	2950
3	1900	4060	10.7	10.7	3250
4	1800	3960	11.3	11.3	3620
5	1750	3910	11.65	11.65	3850
Final	1740	3900	11.72	11.72	3900

Slide-Rule Settings And Results For Conditions of Bare Conductor at 120F

Trial Setting	(H) (Scale CI)	(H)+3690	(d) (Scale D)	(d) (Scale C)	(Yd^2) (Scale A)
1	1700	5390	12.0	12.0	4080
2	1600	5290	12.7	12.7	4570
3	1500	5190	13.6	13.6	5240
Final	1510	5200	13.54	13.54	5200

Successive trials of other sags such as 6, 7, 8, and 9 ft are made on both rules by moving the respective hairlines. Resulting tensions and differences between tensions can be recorded in Table I as shown. Magnitudes of differences between tension readings on the two rules continue to decrease until a sag of 10 ft is tried when the difference in column (6) becomes positive for the first time indicating that we have gone through zero differences and have passed point of intersection of the two equations.

A rough interpolation to find zero point in the range of 780 lb from difference in tension determined by the two equations for a sag of 9.0 ft and at 10.0 ft indicates that our solution lies some six-sevenths of the way between these sags. Next trial sag is chosen at 9.6 ft, however, to be on the conservative side. Interpolating again gives 9.7 and finally 9.78 ft as final sag where difference between equations becomes zero indicating that a solution has been achieved.

Ordinarily this tabulation is kept mentally or at best on a piece of scrap paper. It is easier in mental tabulation to say 630 plus the reading on SR-2 equals the reading on SR-1, selecting convenient, round trial tensions to add to 630. Sags are then noted only during the process of transferring from SR-2 to SR-1 and at final solution.

Calculations For Other Temperatures

Settings of sliders and bodies of both slide rules remain the same in calculating sags of conductor at other temperatures under conditions of no ice or wind loading although it may be necessary to swap indexes for some readings. However, the constant *K* added to the Yd^2 term in equation (6a) set up on SR-1 becomes (—2160) for conditions at 60F and (—3690) for conditions at 120F.

Assuming a sag of 10 ft for conditions at 60F, one reads *H* on the CI scale of SR-2 at 2040. Adding the constant, K = 2160, to this gives a tension of 4200 lb. Tension calculated for this sag on SR-1 is 2840 lb. Succeeding trials at 2000, 1900, and 1800 lb tension on SR-2 have corresponding tensions on SR-1 as shown in Table II. Interpolation shows that the equations intersect at tension of 3900 lb and sag of 11.72 ft. This is stringing sag at 60F which would result in a tension of 4000 lb under heavy loading conditions. Note in Table II that underlined figures are the first or independent settings.

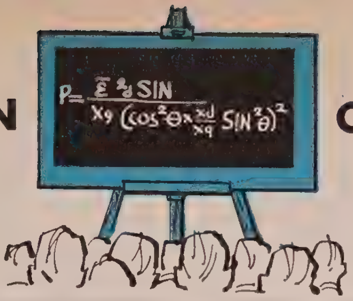
Stringing sags for 120F and for other temperatures are found, using the slide-rule method, in the same way. Calculations shown in Table II indicate that stringing sag at 120F for conditions given is 13.54.

Method of Checking

A very good check for the preced-

(Continued on page 89)

INDUSTRY IN CONFERENCE



EEI T&D Meeting Features Safety, Cable, Pole Treatment, And Reclosers

A diversified program was presented at the EEI Transmission and Distribution Committee meeting held in St. Petersburg, Florida January 21-22. It was attended by 175 members and guests.

A. J. Naquin, safety counselor of New Orleans Public Service, Inc., and chairman of the EEI Accident Prevention Committee, in presenting a brief review of the activities of his committee, said that the utility industry's injury severity rate consistently ranks about the 32nd worst rate of the 40 major industries in this country. The mouth-to-mouth method for both on-the-ground and pole-top resuscitation has been overwhelmingly recommended by the Accident Prevention Committee, Naquin stated.

W. J. Clapp, president of Florida Power Corp., welcomes the T&D group to St. Petersburg.

"Take Another Look" was the title of a sound color film shown. It was produced by Commonwealth Edison Co. and introduced by H. B. McMahan, Florida Power Corp.

Moving Pipe-Type Cable

The moving of a 69-kv pipe-type cable in connection with highway improvements was described and illustrated by A. Gandy, Jr., Potomac Electric Power Co. Two 6⅝-in. outside diameter steel pipes, each containing three single conductor 1500-mcm cables were relocated 6.2 ft for a distance of 702 ft without cutting the pipes by using 1000-ft reverse curves on each end of the relocation which added 32 ft to the length of the line, he said. To obtain slack in the line, each pipe was first raised and moved at the low point in the line in small steps by the use of sand bags. Gandy said that the pipe moved very easily with no apparent strain or tension.

A. B. Craig, Boston Edison Co., in reporting on the revision of Publication Q-7 "Recommended Procedure For the Diagnosis of Cable, Joint and Termination Failures," urged that all companies follow the new procedure for diagnosis of troubles and that this work be done by an experienced engineer.

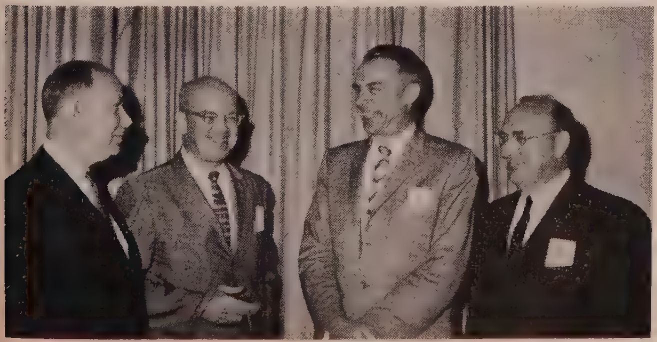
By reworking time-tested tools and developing new equipment, the manpower requirements per crew has been reduced from 15 men, plus a foreman, to four to seven men, plus a foreman (depending on the job), said H. R. Nash, Detroit Edison Co. New equipment includes improved woven wire grips, high-capacity winches, pulling eyes built into the manholes, adjustable cable pulling jacks, power driven reel turning and handling devices and power-driven pneumatic or mechanical duct wiring devices.

Lead Sheath Troubles

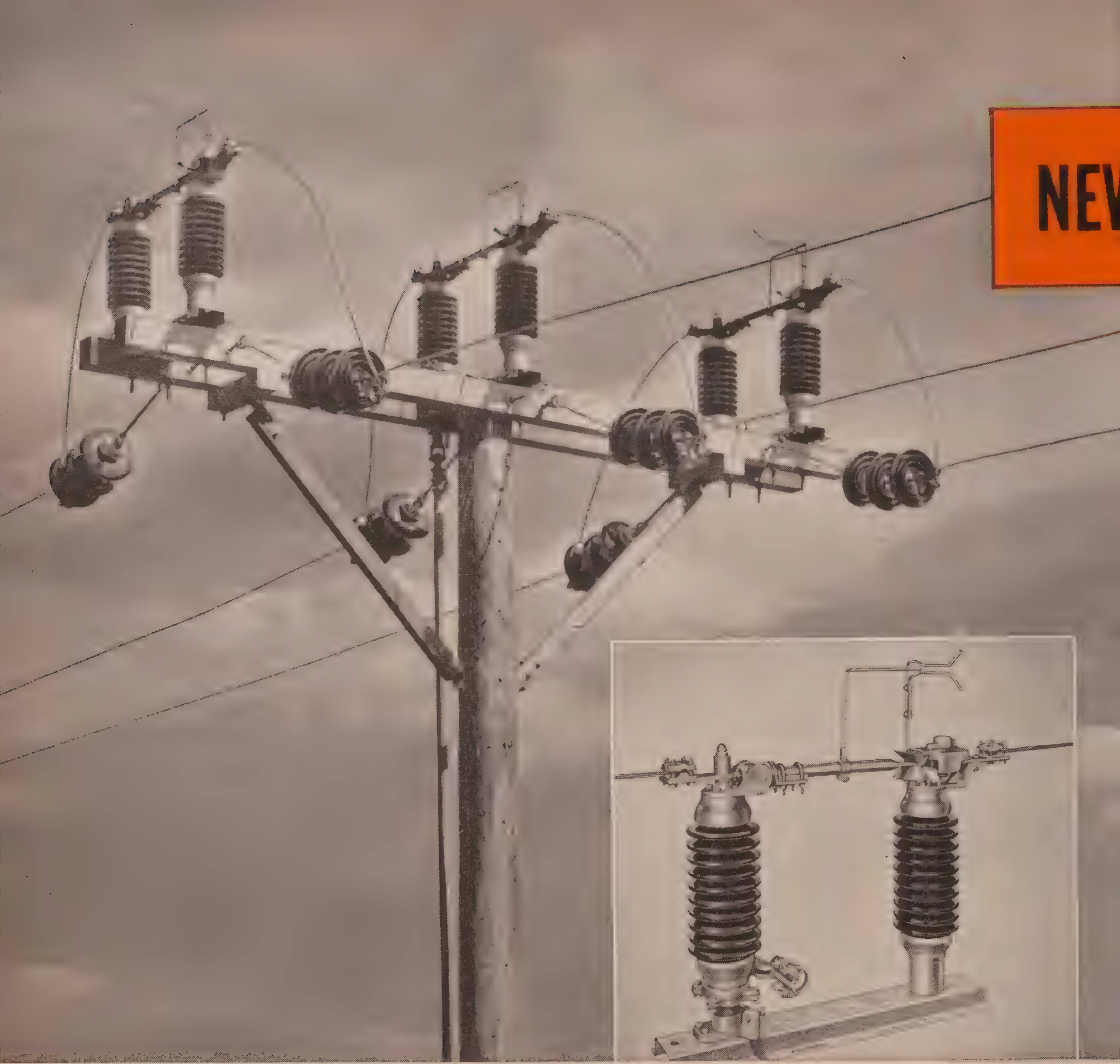
Increased lead sheath troubles due to cable movements in manholes, and to some extent in ducts, arise in many cases because existing small manholes are used wherever possible, in the opinion of R. H. Kolks, Cincinnati Gas & Electric Co. Kolks' paper was presented by H. W. Grate. For new construction, straight-line 7 x 12-ft manholes are built instead of the former 5 x 7-ft size which was considered adequate, Grate said. Other construction changes adopted are: arsenical lead sheath, low-pressure gas-filled construction (for certain installations), a 20-mil resilient binder used in place of a metallic binder, tellurium lead sheath, neoprene or polyethylene jacket, sector conductors annealed after compacting, and lay of conductors shortened.

A. B. Craig, Boston Edison Co., discusses recommended procedure for the diagnosis of cable, joint and termination failures.

A progress report (No. 5) on the AEIC-EEI Extra-High-Voltage Cable Field Test Project, by L. G. Smith and G. P. Adams of Baltimore Gas & Electric Co. was presented by John Hennessy of that Company. The construction of the



EEI T&D Committee Chairman H. E. Cody, Cleveland Electric Illuminating Co., (second from left) poses with Subcommittee Chairmen: A. J. Naquin, New Orleans Public Service Inc., Accident Prevention; H. W. Dannettell, Potomac Electric Power Co., Safety; and O. F. Tulloch, Boston Edison Co., Underground.



NO OTHER SIDE-BREAK DISCONNECT GIVES YOU ALL OF THESE OPERATING ADVANTAGES

- **Correct contact always maintained at blade tip even if crossarm warpage distorts the switch base.**
- **All blades engage fully in the break-contact jaws without precise adjustment of the inter-phase rods.**
- **Less time and labor to install with Kearney original wide-tolerance mechanical design.**
- **Easiest, surest ice-breaking ability available on both opening and closing.**

This newest Kearney development solves long-existing operating problems of crossarm mounted group operated side-break disconnects. The best supporting structure or crossarm construction may . . . due to ice loads, age, wind or line strain . . . deflect enough to distort the switch bases, or alter the relative positions of the three phases. This often causes loss of contact or failure of all blades to close completely in conventional disconnects with both rigid blades and stationary break-contacts.

Kearney's advanced design features a self-aligning blade constructed to permit controlled vertical movement and axial rotation. This automatically compensates for base distortion . . . keeps the blade tip correctly aligned in the contacts. The break-contact swings 30-degrees with the blade as it is opened or closed, producing high leverage ice-breaking ability and full wiping of the silver current transfer surfaces. On closing, the blade tip fully engages the break-contact before the contact moves from its angular open position, compensating for any shift in position of the switch bases. This same feature also allows considerable freedom in interphase rod adjustment, enabling Kearney **Self-Aligning** side-break switches to be installed faster and more economically than other types.

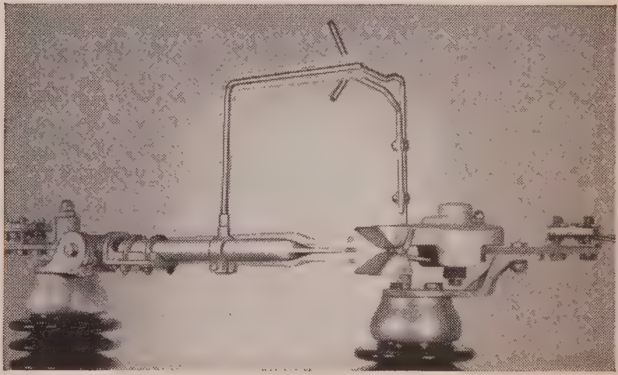
The details of these original features for maintenance-and-adjustment-free operation are shown on the facing page.

Kearney's

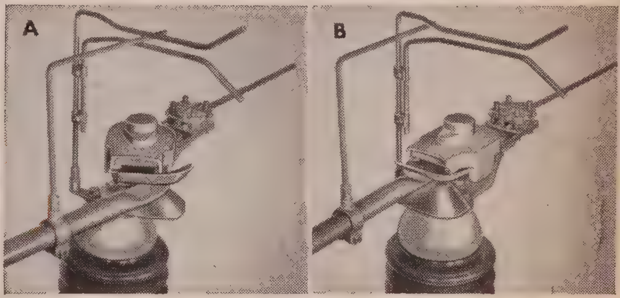
Self-Aligning SIDE-BREAK DISCONNECTS

. . . always make positive contact, even if the supporting structure warps, twists, bows or settles.

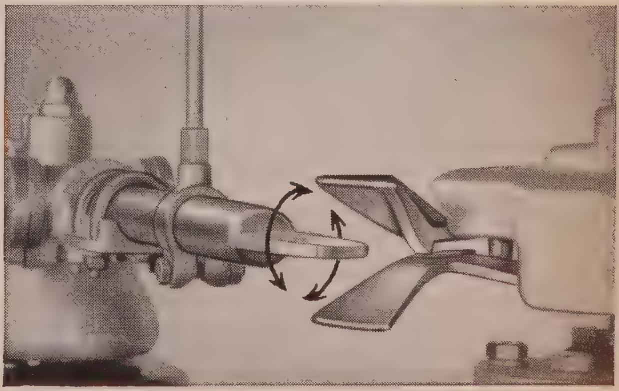
Self-aligning blade moves in a vertical plane to re-establish the original relationship between blade tip and contacts if supporting structure warpage distorts switch base. Wide mouth contact jaws assure blade entry into the contacts. Vertical 1¼″ movement more than corrects for extreme cases of misalignment.



Break-contact swings 30° in the plane of blade travel as switch is opened or closed, providing highest leverage ice-breaking and full wiping of the current transfer surfaces. Note that the blade tip is fully engaged, and full contact is maintained (A) through the final 20° of blade travel to the fully closed position shown at (B). This feature allows more latitude in phase rod adjustment than other designs.



Blade rotates 12° on its longitudinal axis. If base distortion has affected blade-contact alignment, the blade tip will rotate as it enters the break-contact to keep all contact surfaces parallel, automatically restoring contact alignment. Friction reducing construction at all rotation points minimizes operating effort.



Switch carries full-rated load current well within NEMA temperature rise, from a fully closed position to 20° partially open position. Ratings available, 7.5 through 69 kv, 600 amperes. Equipped with conventional or whip-type arcing horns . . . torsional or spade-type operating mechanism. May be mounted horizontally, vertically, or underhung.

For full details talk to your Kearney representative, or write direct for Bulletin 8B.

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test station is well under way, and one cable was installed in December 1959. The remaining cables are expected to be installed by April 1960, he reported.

HV Cable Failures

T. C. Duncan, Consolidated Edison Co., reported on a 138-kv oil-filled pipe-type cable circuit failure which occurred on the Con-Edison system on August 28, 1959. The failure was at the end of a splice and repairs were made by lengthening the splice so that no cable replacement was required.

V. O. Bernthal, Commonwealth Edison Co., reports on joint troubles and failures of 138-kv oil-filled cable.

A report was given by V. O. Bernthal, Commonwealth Edison Co., on joint troubles and on failures in two adjacent lengths of 138-kv single-conductor low-pressure, oil-filled cable in an 11-mile 1953 Commonwealth Edison line. The joint casings contained insulators and special bonding to eliminate sheath losses, but the joint between the two cable lengths developed a short circuit of the induced voltage across the insulator. This produced arcing of the joint oil, and the resultant gas traveled back into the cables to cause ionization in the cable insulation and eventually the two failures.

Examinations of joints on this and other similar lines showed burning in 11 other joints in this line, but to only a small extent. Subsequent to these troubles in August 1958, there has been no further troubles on these lines.

Such joint troubles in Chicago and elsewhere, which stemmed from design and construction deficiencies, were said to emphasize the continuing need for good engineering organization as well as for engineering follow-up of field construction in regard to high-voltage underground cable and accessories.

Underground Residential Distribution

An increasing number of new subdivisions and other new loads will be served underground as more developers observe the present installations and attempt to compete with the developments now being served underground, according to D. C. White, Portland General Electric Co. Many developers, builders and real estate people have found that underground service is a factor in the sale of a home and are now insisting that this is the only way the job should be done, he said. The cost difference compared with overhead service has averaged $147 per lot for 14 subdivisions. He estimated that his company's expenditures for pad-mount transformers will increase from 7½ percent (of total distribution transformer expenditures) in 1959 to nearly 20 percent in 1960.

Pole Groundline Treatment

M. C. Westrate, Commonwealth Services Inc., describes liaison activities of the System Planning Subcommittee; C. E. Bathe, Oklahoma Gas & Electric Co., at right, is General Engineering Subcommittee chairman.

Annual savings of about $120,000 are expected by Union Electric Co. from a program of groundline treatment of 7500 standing poles each year, according to a study by R. G. Steiner and O. W. Weiss of that Company. In the study reported by Mr. Steiner, the basic treatment of each pole consists of: excavating around pole to a depth of about 18 in., removing any loose or decayed wood, applying a preservative compound, and backfilling and tamping the excavation. This treatment protects against further decay for a period of 7 to 10 years. Steiner stated that he believed each utility should make its own evaluation of the economics of a similar program.

W. H. Johnson, American Electric Power Service Corp. said that several thousand 8-lb fully-treated pine poles were inspected during the past two or three years in various parts of the AEP System. Varying locations show different rates of rejection for the same age groups of poles, all 15 to 30 years old. He concluded that poles removed, reclassified and reused elsewhere, would need a supplementary ground-line treatment and that for pressure-treated southern pine poles, ground-line inspection is a reliable means to establish a life extension program. Records are a very important part of an adequate maintenance program, Johnson said, but records that apply to one area should not be used as a basis for a program in other parts of the country.

In describing the pole treating and inspection program of the Pennsylvania Power & Light Co., D. A. Campbell, Jr. said that pole life has been extended and very little useful pole life is discarded. In addition, pole maintenance costs have been reduced, knowledge of the physical condition of the pole plant is available, service continuity has been improved and many public hazards eliminated, he stated.

A. B. Weaver, Central Power & Light Co., showed a color motion picture which illustrated the ground-line treating procedures of that Company.

R. Hicock, Connecticut Light & Power Co., describes his company's cadet program in action.

Circuit Recloser Economics

A savings of $3,500 to $4,000 can be made on each substation feeder position by using a circuit recloser instead of a circuit breaker, said W. L. Carey, Portland General Electric Co. But the recloser may do the job no better than a good circuit breaker, with the possibility of doing a poorer one, he declared. However, the application of oil circuit reclosers on 12.5-kv circuits is definitely economical, Carey said.

Recloser Characteristics

According to tests at Cleveland Electric Illuminating Co., there is considerable variation in reclosers as received, said H. C. Bingham of that Company. They are spread pretty much over the whole advertised plus or minus 10 percent band when factory checked, he declared. By means of these tests, CEI can now determine if any single-pole recloser of a group can be coordinated with the rest of the system. This includes both new reclosers, or those which have just been maintained, Bingham said.

Joint Use

A. M. Pfeifer, the Detroit Edison Co., outlined some of the highlights of his Company's unique joint-use arrangements with the Michigan Bell Telephone Co., including joint tree work, joint rights-of-way, annual payment for joint use, method of annually determining the number of joint poles subject to rental and the method of billing.

Cadet Program

Based on an evaluation of the experience of the Connecticut Light & Power Co., a cadet training program should be an integral part of the Company management-development plan, according to R. Hicock of that Company. He said that programs should be given a bias in the direction of anticipated assignment to production, or transmission and distribution; also that the final cadet assignment should be in the same location as his initial assignment as a junior engineer. Training methods should increase the amount of productive work accomplished to fulfill the desire of the cadets for some challenging assignments during their period of training, Hicock declared.

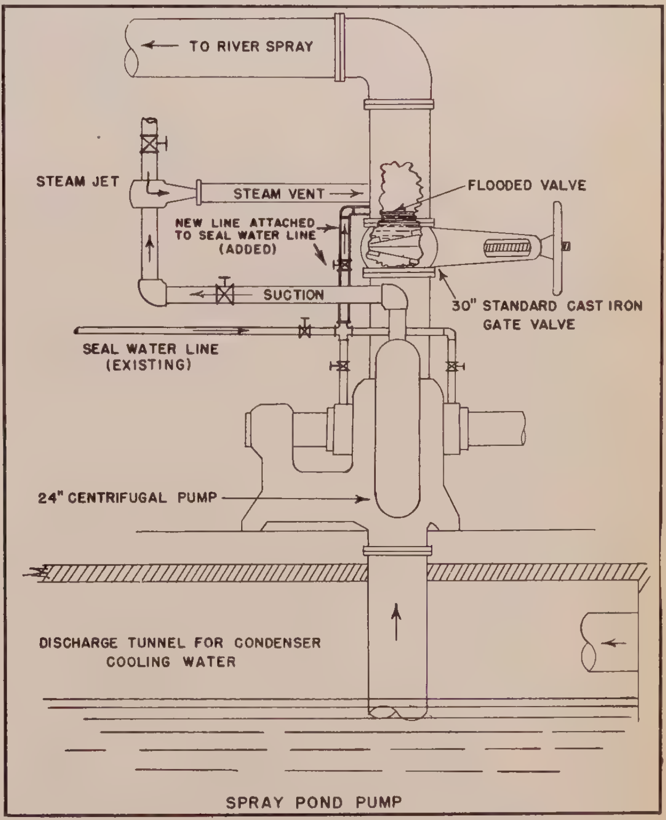
ELP UTILITYMAN'S NOTEBOOK

WATER SEALING EXTENDS VALVE LIFE

By **GEORGE FREY**
Mechanical Maintenance Supervisor
Logan Plant
Appalachian Power Co.

The use of water sealing has prolonged the useful life of two worn 30-in. gate valves at the Logan, West Virginia, plant of the Appalachian Power Co.—thus eliminating extremely expensive repair or replacement. It is expected that the life of these valves may be extended for several years—long enough to permanently avoid repairs costing about $3500.

This method has been used to prime one pump at least once a day for several months during the Spring and frequently during the Summer when river temperatures were higher. It has worked so well that the second pump is being converted for similar operation. Total cost was less than $10 for labor and materials.


TO RIVER SPRAY
STEAM JET
STEAM VENT
FLOODED VALVE
NEW LINE ATTACHED TO SEAL WATER LINE (ADDED)
SUCTION
30" STANDARD CAST IRON GATE VALVE
SEAL WATER LINE (EXISTING)
24" CENTRIFUGAL PUMP
DISCHARGE TUNNEL FOR CONDENSER COOLING WATER
SPRAY POND PUMP

New ¾-in. line added to the seal water line enables defective gate valve to be flooded and permits pump priming. Before flooding, worn gate and ring seat on valve would leak air and prevent priming.

In order to send cooling water to the spray pond and river de-icer, each 24-in. centrifugal pump must first be primed with the 30-in. gate valve in the pump discharge line closed. While this valve is closed, the pump is primed by operating the steam jet for a short time and then reopening the valve. Ordinarily, closing the valve creates a partial vacuum that brings water up through the pump. However, the gate guide and ring seat surfaces on these valves have become so worn and eroded that the valves no longer seal tightly. When this condition got so bad that one of the pumps could not be primed, it was necessary to solve the problem.

To return the valve to satisfactory condition would have required either extensive repairs or an entirely new valve body and gate. Either way, the cost seemed prohibitive, especially when the age and relative efficiency of the units are considered. It was determined that the same sealing effect could be obtained by flooding the discharge side of the valve with water while operating the steam jet to prime the pump.

The drawing shows how a short section of ¾-in. piping, a few fittings, and an inexpensive gate valve were used to obtain the high-pressure water supply needed. It was a simple matter to tap into the nearby service water header that feeds the packing seals on the same spray pond pump.

"When we talked about the Plan person-to-person, participation jumped 30%!"

In our company we've made the Payroll Savings Plan available for some time. I thought, naturally, that we had a large participation. But when I checked up a few weeks ago I discovered that only about 22% of our people were making use of the Plan. It's so easy to say, "Sure, this is a fine idea, and I'll sign up next payday."

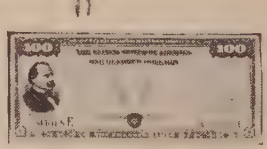
What our people needed was someone to explain this convenient savings plan *in person;* someone to show them that just signing the card would put this fine thrift program into automatic operation. They needed somebody to invite them to *start right now.*

When I contacted our State Savings Bonds Director, he helped us set up a thorough, informative canvass of everybody on our staff. As a result more than 30% additional employees signed up for this easy, systematic way to buy U.S. Savings Bonds, *regularly.*

Perhaps *your* organization, too, has a large percentage of employees who have *never been invited* to combine patriotism with basic thrift through the Payroll Savings Plan. Companies with high employee participation are enthusiastic about its benefits in terms of lower employee turnover, better safety records, and the satisfaction engendered by helping large numbers to contribute to our Nation's Peace Power. The greater your employee participation, the more substantial your company benefits will be. Contact your State Savings Bonds Director for prompt, practical help in spreading Payroll Savings information, *person-to-person.*

NOW! U. S. SAVINGS BONDS EARN 3¾%

ELECTRIC LIGHT & POWER



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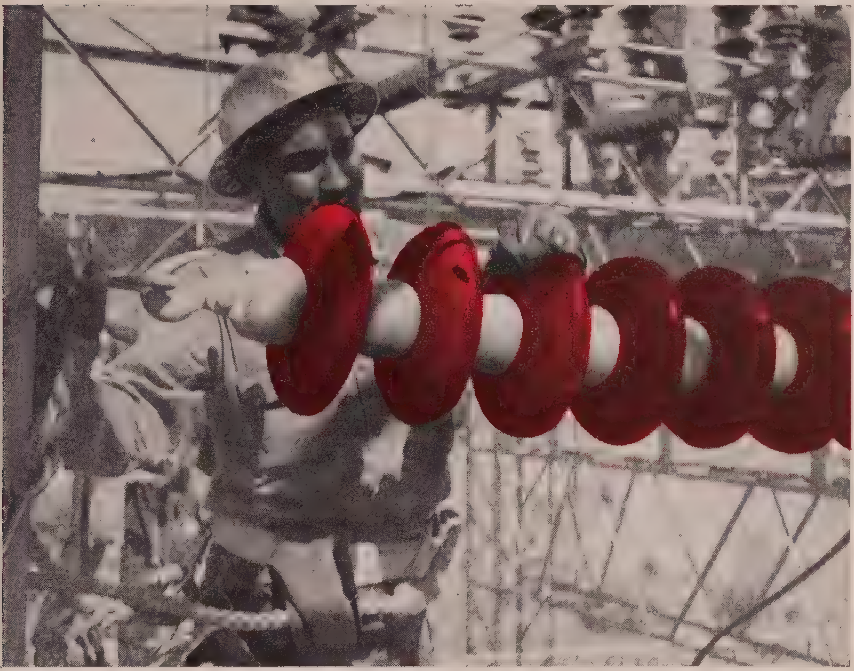
SILICONE NEWS from Dow Corning

"Wipe Away" Maintenance



Coating of Silicone Compound Cuts Outages and Cleaning Costs

Preventing conductive leakage paths on power insulators in heavily contaminated areas is greatly simplified by an easy-to-apply coating of Dow Corning silicone compound.

Reduced maintenance plus fewer, shorter outages make substantial savings possible. One Midwest utility, with a 35.5-kv line and substation located near a cement plant, was forced to dissassemble its insulators 3 times a year for thorough scrubbings with solvents and steel wool. Now, after coating these insulators with silicone compound, contamination is simply wiped off with dry rags every six months and a new silicone coating applied . . . at a fraction of the cost and outage time formerly involved!

Another company reports silicone compound has reduced its cleaning schedule on 138-kv insulators by 75%. Other utilities from coast to coast report similar savings . . . have found Dow Corning silicone compound effective against such airborne contaminants as: cement dust; detergents; carbon black; salt accumulation from sea water; fertilizer and alkali dust; fly ash; general industrial dust; metallic ores such as taconite, aluminum and lead ores, chemicals such as sulfuric acid, calcium chloride and soda ash.

Dust from stacks of cement plant, visible in the distance, posed a severe flash-over problem before insulators were silicone coated.

Silicone compound is easily applied with a rag or stiff brush . . . solvent dispersions can be brushed or sprayed on.

Prevent Arcing, Flashover Damage. Dow Corning silicone compound is highly repellent to water or moisture, will not melt in hot weather or turn stiff in cold weather, and has excellent electrical resistance. Photo-micrographs reveal the silicone compound completely surrounds dust, dirt and other contaminants to prevent them from absorbing water and becoming conductive. The photo illustrates how moisture "beads" on the silicone coated surface and rolls off harmlessly without forming conductive moisture paths. The protection is effective so long as moisture "beads".

Cleaning Greatly Simplified. Even the most tenacious contaminants can be easily wiped off treated insulators and a new silicone coating applied in a matter of minutes. It's unnecessary to remove insulators from their mounts, to use solvents, steel wool, wire brushes or set up elaborate cleaning procedures.

For complete information on how you can reduce insulator maintenance and avoid frequent, prolonged outages with a Dow Corning Silicone Compound, write Dept. 1403

Your nearest Dow Corning office is the number one source for information and technical service on silicones.

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

E and LP MANUFACTURERS/PRODUCTS

All-Aluminum H-Frame Tests OK

A unique all-aluminum H-frame electrical transmission structure has satisfactorily passed performance tests on the Nantahala Power & Light Company system.

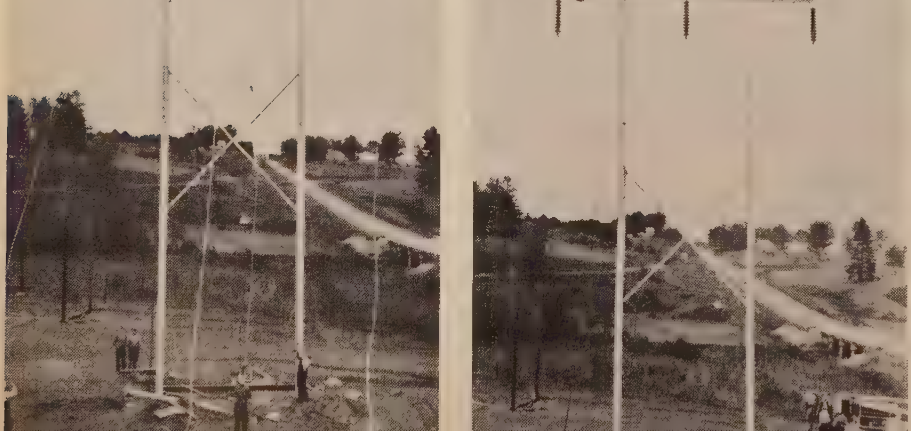
The structure was tested, after conductors and ground wires were installed, for several combinations of the following loads: total transverse load, 7000 pounds; longitudinal load at any one conductor support, 5000 pounds; vertical load at any conductor support, 1500 pounds; longitudinal load at any one ground wire support, 2900 pounds.

Each vertical leg of the structure is assembled from two 11-inch diameter, ¼-inch wall, 6061-T6 alloy tubes, spliced together by welding to make a tube of 73 feet over-all length. The crossarm is a 34-foot-long assembly of eight-inch back-to-back channel shapes, laced with small angles. The tower and crossarm bracing is thin-walled tube.

The design was prepared by Aluminum Company of America structural engineers as part of an investigation of tower materials and designs for one of its own proposed 161 kv transmission lines.

Corrosion and deterioration of tower materials, along with inaccessibility of tower sites, are prime motives in the electrical industry's present investigation of lightweight, corrosion-resistant aluminum towers for use in adverse operating condition locations. Alcoa has recently worked with Portland General Electric Company in supplying tubular aluminum crossarms for wood H-frame towers, and is investigating an all-aluminum H-frame tower, for inaccessible area installation for another western utility. In addition, Alcoa is designing and fabricating aluminum double-circuit towers for new lines of several major utilities.

EXPERIMENTAL H-frame aluminum transmission tower under test on the Nantahala Power & Light Company system. Left, stringing conductors on the tower. Right, tower under transverse load test. Note block-and-tackle assembly exerting load at upper left of crossarm; also note deflection of upper portion of tower. Tower was designed by Aluminum Company of America structural engineers as part of a project to explore tower materials and designs for a proposed 161 kv Alcoa line. (Alcoa photo)



Indicted Manufacturers Move To Right Abuses

With a strong indication that there was more to come, the U. S. Dept. of Justice named 13 of the electric utility industry's key suppliers in charges of Sherman anti-trust law violations announced in mid-February.

Named in the indictments are: General Electric, Westinghouse, Allis-Chalmers, I-T-E Circuit Breaker Co., Lapp Insulator Co., Ohio Brass Co., McGraw-Edison Co., H. K. Porter Co., Inc., Hubbard & Co., Joslyn Mfg. & Supply Co., Porcelain Insulator Corp., A. B. Chance Co. and Southern States Equipment Co.

Said the Justice Department's Robt. A. Bicks, acting chief of the agency's anti-trust division: "These indictments and civil actions are the first in a series of proceedings arising out of the Department's extensive grand jury investigations into all phases of the heavy electrical equipment industry. The investigation is continuing into other phases which involved products of significance to industry and national defense."

The indictments charge that for several years (and in some cases since at least as early as 1951) "the defendants conspired to: (1) fix and maintain prices, terms and conditions of sale; (2) allocate among themselves the business of supplying equipment to Federal, State and local government agencies; (3) submit non-competitive, collusive and rigged bids for supplying equipment to governmental agencies electric utilities and industrial contractors and corporations throughout the U. S.; (4) refrain from selling certain types of assemblies and components purchased by non-defendant manufacturers of electrical equipment for use by them in equipment assemblies to be sold in competition with defendant manufacturers, so as to eliminate competition from them."

The companies and their affected employees, of course, have been aware of the investigation and the grand jury proceedings for months. With many of the individuals appearing to testify, corporate management had urged full cooperation. Thus, the Justice Dept. charge was less of a surprise than a shock to not only the parties involved but the industry as a whole.

As EL&P goes to press, most of the accused companies declined to comment on the situation, indicating that the official documents had not been received. However, GE, Westinghouse and Allis-Chalmers responded immediately with public statements—all of which declared strongly that such actions as were attributed to their representatives are contrary to long-established corporate policies.

Early this year, GE had been the first to admit guilt in the areas under Justice Dept. probing. But Chairman Cordiner denied top management knowledge of the alleged illegal actions (see EL&P, Jan. 15). As he did then and as he repeated after the indictments were returned, Westinghouse and Allis-Chalmers executives made it clear that these marketing procedures are not condoned, nor are the accused individuals excused for their errors.

Companion civil actions filed by the Justice Dept. seek injunctive relief against the various practices alleged. These suits seek to require the companies to issue new price lists based upon costs independently arrived at, to submit affidavits on non-collusion with future bids to governmental agencies and to prevent any communication among the defendants with respect to future bids and price quotations.

Worthington Schedules Nation-wide Meetings

In an effort to effect a closer working relationship with electric utility companies, the Worthington Corporation has announced plans for a series of nation-wide "Steam Power Symposiums."

Designed to operate over a number of years, the symposiums in 1960 alone will play host to a leading utility in each of about 15 cities.

The program will consist of a vide screen color film presentation, series of prepared visual demontrations, individual product presntations, and discussions by key Vorthington executives.

Seven men from Worthington's Iarrison division will travel with the symposium. Key local personnel from the company's district offices will augment the permanent staff.

To explain the company's objectives with regard to utilities, the Worthington symposiums will cover the following broad areas:

1. The background and development on steam power plant fluid handling equipment.
2. New application concepts.
3. Establishment of more effective communication between the company and the utility.

At present, approximately 40 per cent of the Harrison division's output is going into the electric utility industry.

J. F. Sebald, Chief Engineer of Steam Power, and I. J. Karassik, Consulting Engineer and Manager of Planning, discuss Worthington's new "rational approach to Steam Service Condenser Design." The details of this engineering "break through" will be made public for the first time in Worthington's Steam Power Symposiums, planned to travel throughout the nation.

*Trademark

Fine Fanner Superformed Products

"Superforms* sure fill the bill for a STANDARDS ENGINEER!"

"Fanner Superformed products meet our standards all along the line . . . *technical superiority, accurate manufacture, uniform quality, dependable performance.*"

More and more Standards Engineers . . . *the men who must find BETTER ways to do things BETTER* . . . are testifying that Superforms meet the highest standards.

A-1580A

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ARMOR RODS . . . Protect long-span T&D lines at supports

LINEGUARDS . . . Protect short-span T&D lines at supports

PATCH RODS . . . Repair damaged conductors

TAP ARMOR . . . Protects conductor at tapping points

FANNGRIPS . . . For dead-ending strands and conductors

FANNSPLICES . . . Join two ends of conductor wire

PLASTIC PRODUCTS . . . For conductor surface protection

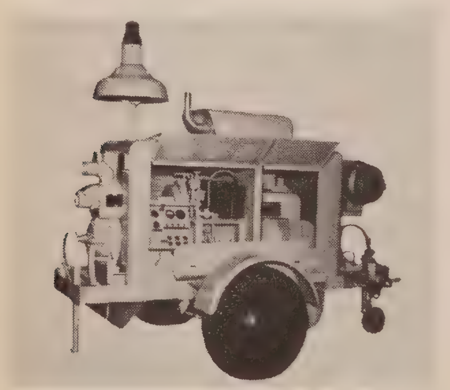
FANNER
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

NEW PRODUCT DESIGN

Manhole Service Vehicle

A vehicle by **United States Motors** is designed for manhole work where electric power, dewatering pump, and compresser must be supplied. Unit is self powered by either LP gas or gasoline. Engine is air cooled.

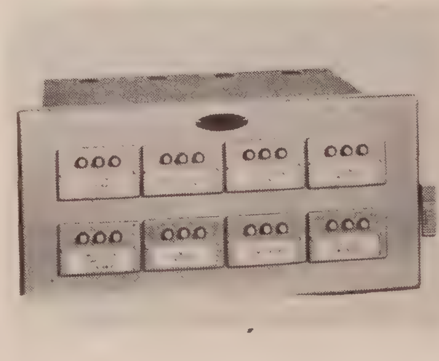
For more data, mark #30 on reply card



Gas Detector

Model 521 probe type gas detector by **Houston Instrument Corp.** provides indication and alarm when gas concentrations reach unsafe levels. Unit may be operated as a portable instrument or as a fixed indicator alarm with up to 100 ft. of cable to detector element. Will operate on line voltage or on battery power. Indicator is calibrated in per cent of lower explosion limit of desired gas. Also allows individual classifications in multi-gas mixtures.

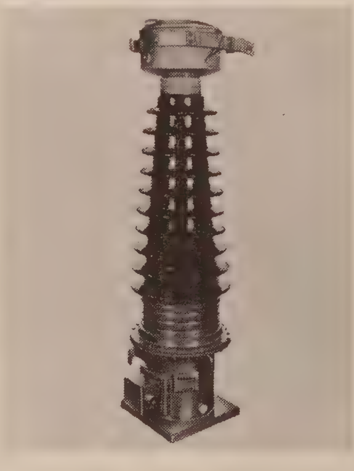
For more data, mark #31 on reply card



Sequential Annunciator

Panalarm div. of Panellit, Inc. has announced a digital sequential annunciator which will monitor an infinite number of alarm points, with three variations to handle 7, 15, or 31 off-normal-sequence points at a time. Alarms are both audible and visible.

For more data, mark #32 on reply card



H-V Current Transformer

Type ACT high voltage current transformers by **Westinghouse** is applicable for metering and relaying purposes. The unit is available in all voltage classes from 115 kv (550 kv BIL) with dual current ratios of 10/20 to 1500/3000 amps. The solid insulation principle pioneered in the type APT potential transformer is employed. With mounting dimensions of 17 by 17 in., the ACT is 10 per cent shorter and 20 per cent lighter than the earlier OCT.

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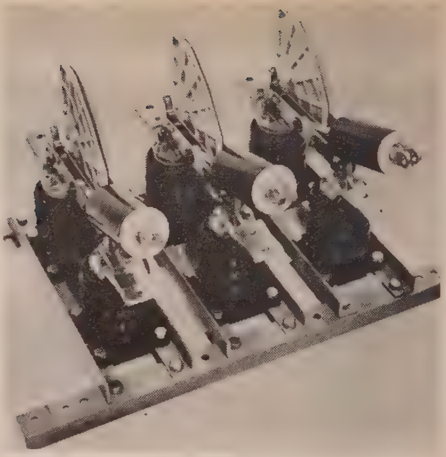


Load Interrupting Switch

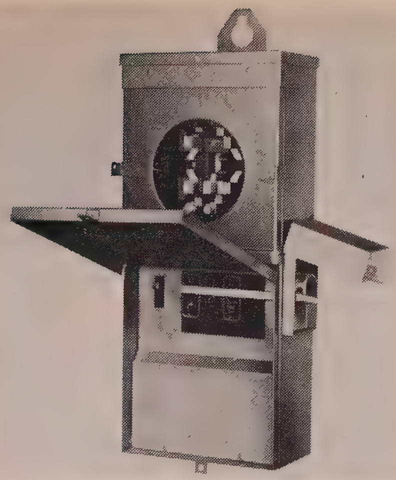
Load interrupting switch (Type AC, indoor) by **Three E Co.** is capable of interrupting 600 amps. An auxiliary switch blade breaks an arc drawn between two high-arc-resistant silver tungsten alloy contacts in polyester plates in the switch housing. It operates in conjunction with the main switch blade. Auxiliary blade speed, together with deionized gasses evolved by the polyester plates breaks the arc.

For more data, mark #34 on reply card

Spacer Type Cable System

A spacer system featuring a simply designed spacer, high-strength aluminum messenger and insulated conductors specially constructed for use with spacers is available from **Kaiser Aluminum.** Of one-piece Plexiglas, the unit allows one conductor to be handled at a time. Cables are held six inches apart. Phase conductors are of hard drawn EC grade aluminum with a minimum conductivity of 62 per cent IACS.

For more data, mark #35 on reply card



Pole-Mounted Meter Entrance

By **Hi Products, Inc.,** the Hi-Liner Series UMB-200 pole mounted meter entrance cabinet provides 200 a. circuit breaker entrance service for underground secondary systems. A 200 a. meter socket, 200 a. circuit breakers, secondary wiring trough and terminal are all combined in one neat pre-wired package. Unit may be equipped with breakers of lower amperage if requirements are below this range. Extra 30 a. breaker may be included for pump or water heater.

For more data, mark #36 on reply card

De-rusting, De-scaling Tool

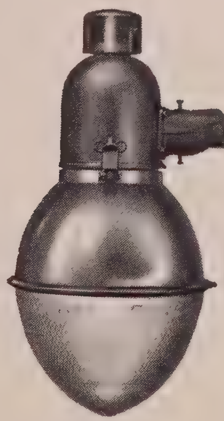
Vonarx Air Gun operates on ompressed air from any industrial ompressor. Spring loaded recoil ction moves a series of hardened teel needles in a rapid back and orth movement. Each needle operates separately to adjust for con- our of the surface being cleaned. Even the softest stone can be leaned without marring the sur- ace. Normal needle life is 200-400 ours. Available from **Swissair ool Corp.**

or more data, mark #37 on reply card

Photoelectric Luminaires

Recently introduced by **Joslyn Mfg. and Supply Co.,** photoelectric luminaires for automatically switching street lighting on and off are now available for all types of light distributions and for either incandescent or mercury lamps. Photoelectric relays of either the plug-in or twist-lock types attach direct to the luminaire head and are fully wired for automatic operation. The line is fully described in bulletin 20-A, available on request.

For more data, mark #38 on reply card



Hydraulic Derrick

Rectangular side legs and an extra-long middle leg hydraulic cylinder provide greater strength to withstand abuse than previous models. The longer middle leg cylinder allows the derrick head to come closer to the ground for forcing the digger deeper into the soil. Integral middle leg with live boom action provides extra power for butt-pulling, body loading transformers and heavy equipment and forcing diggers into frozen soil. By the **Holan Corp.**

For more data, mark #39 on reply card

*Trademark

Fine Fanner Superformed Products

"Superformed* spells S-A-F-E-T-Y to a SAFETY SUPERVISOR"

"We Safety Men must look at any piece of equipment from the *safety* angle.

"Fanner Superforms? Sure, they are safer for our linemen to handle. Not unwieldy . . . no tools required for dead-line application . . . easily controlled with hot-line tools . . . ends are carefully machined to prevent rubber-glove puncturing . . . safer than straight wires and aluminum ribbon."

Everywhere, Safety Engineers, *the men who guard the safety of people,* have a good word for Superforms.

A-1583A

FANNER *Superformed** with a **"PROTECTIVE TWIST"**

ARMOR RODS . . . Protect long-span T&D lines at supports

LINEGUARDS . . . Protect short-span T&D lines at supports

PATCH RODS . . . Repair damaged conductors

TAP ARMOR . . . Protects conductor at tapping points

FANNGRIPS . . . For dead-ending strands and conductors

FANNSPLICES . . . Join two ends of conductor wire

PLASTIC PRODUCTS . . . For conductor surface protection

FANNER
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

SUPPLY FACILITIES

GE to Expand M&P Lab Facilities

Ground will be broken in the spring for a new $3.5-million Materials and Processes Laboratory to be erected in Schenectady, N. Y., by General Electric's Large Steam Turbine-Generator Department. Construction is scheduled for completion in the latter half of 1961.

The current M and P laboratory, oldest in Schenectady, was established in 1894 and has been scattered in several buildings at the Schenectady plant. The new building will bring all functions of the laboratory under one roof and closer to the other buildings of the Large Steam Turbine-Generator Department, of which the laboratory is a sub-section of the engineering section.

W. E. Saupe, department general manager, said, "With the cost advantage that foreign turbine manufacturers have, one of our most effective means of competing with them and with domestic manufacturers in the future will be through continuing and extending our product leadership. For this, skill and innovation in design must be accompanied by development and utilization of new and better materials and processes.

"We believe that laboratory personnel will be aided significantly in their efforts to develop new technological breakthroughs by consolidating most laboratory operations into a modern building designed to help create the kind of atmosphere in which scientific people can make their best contributions."

The new structure will be a 240-foot two-story hollow square with a center section 110 feet square constructed in the hollow area. Although it will be two stories high, the center section will be erected as a single-story building. The structure will have 110,000 square feet of space. It will have a glass and enamel curtain wall front, brick-on-block sides and rear, and coping, flashings and windows of aluminum, and will be completely air conditioned.

Sales Briefs

Westinghouse Air Brake Co. has announced that it will move its scattered **Le Roi division** operations into one operating unit which will be established in Sidney, Ohio. The move will be made to eliminate costly duplication of manufacturing operations. The new consolidated unit is scheduled to go into operation by mid-1960.

Houghton Laboratories has changed their corporate name to **Hysol Corp.** The company was the first in its field to offer commercial lines of epoxy adhesives and electrical insulation to industry.

Pioneer Electric Eastern, Ltd. has been licensed to manufacture **National Supply Company's** Spang underfloor duct and Spang header-duct.

Production Briefs

Combustion Engineering has announced that it has terminated its sales agency agreement with **T. C. Heyward and Company**, Charlotte, N. C., and Jacksonville, Fla. The move was made to bring these sales areas under the company's sales policy of direct negotiations between customers and the company's own personnel.

Pennsylvania Transformer division, McGraw Edison Co., has opened a branch sales office in Chattanooga, Tenn. The office will be managed by **Edmond P. Zimsky**, former factory representative for the southeastern district.

Charles W. Avery has been appointed machinery mount field engineer by the western division of **Barry Controls, Inc.**

L&N Negotiates Purchase

Leeds & Northrup Co. have announced that negotiations are under way for the cash purchase of the outstanding stock of the Thomas S. Gassner Co., Inc., of Philadelphia. I. Melville Stein, President of Leeds & Northrup Company, indicated that he expects the actual acquisition will take place during the first quarter of 1960.

The Glassner Co. has been a supplier to the Leeds & Northrup Co. for over 40 years, furnishing steel panels and cubicles for control instruments and integrated systems, consoles for laboratory instruments, enclosures for L&N heat treating furnaces, and other sheet metal items.

Mr. Stein indicated further that, upon acquisition by Leeds & Northrup Co., the Gassner Co. would continue to operate as an independent unit, with its present personnel and management.

A. B. Chance To Build Research Center

The A. B. Chance Co. will break ground sometime next month for a new engineering research center. The new building will allow Chance to bring together all its engineering and research personnel, from all its plants, and to expand its engineering facilities.

The building will include a complete high-voltage lab for impulse and 60-cycle testing, heat run and short circuit interruption test facility, environmental laboratory, mechanical lab, plastics lab, shop, and offices, conference rooms, and library. Outdoor test facilities adjoin the building.

A 2,400,000-kv impulse generator will be used for high-voltage tests. High-current tests will be powered by a large rotating generator with a peak output of 500,000 kva.

The facility, to be constructed at the Centralia, Mo., headquarters of the company, will serve the company's other plants in Pittsburgh, Pa., Parkersburg, W. Va., Carey, Ohio, and Toronto, Canada.

Commonwealth Associates are the consultants on the project. According to a company spokesman, the engineering research center is scheduled to be completed sometime late this year.

Begin First Major Medallion Project Under New G.E. Plan

Ground has been broken in Palm Springs, California, for a 204-apartment total electric co-operative garden court—the first major Gold Medallion development under General Electric's newly-formed Residential Market Development Operation. The project, to be called the Trudy Richards Park Imperial, has been certified by the California Electric Power Company to qualify for the Gold Medallion award.

To The Editor . . .

Dear Editor:

I feel I must call your attention, and that of EL&P's readers, to an error of fact in your issue of January 1, page 58.

You stated that the cause of a recent price reduction "up to 27%" on oil circuit breakers by a "competitor" could be attributed to the entry of a heretofore regional manufacturer into national distribution, effective January 1.

Federal Pacific announced its price reductions from 2½% to 27% on oil circuit breakers on November 17, 1959. These reductions were made possible by (1) economies affected through consolidating manufacturing operations in Federal Pacific's new plant at Santa Clara, Calif., (2) new ASA standards for high voltage entrance bushings, an important component of power circuit breakers, which reduced manufacturing costs, and (3) certain technological advances within our company.

We decided to pass these benefits along to our customers in the form of lower prices, and announced this to the industry some six weeks before your story appeared. Obviously, these plans must also have been in work for some time prior to the announcement, and therefore could not have been predicated on the activities of another company.

Your readers may have received the highly erroneous impression that Federal Pacific's policies depend on the activity of a certain competitor in the OCB field. I hope that, having called your attention to the facts, this will set the record straight.

Robert L. Bobo,
Vice-President

Federal Pacific
Electric Company

Dear Editor:

Reprints of Article titled "Stresses Why USSR Trails U.S. in Electric Power" printed in "ELP" January 1, 1960 should be made available to all Public Utilities for mailing with their monthly electric bills.

Too many of our U.S. Citizens do not realize the constant battle the Utilities put forth to increase efficiency in our Generating Plants and to keep KW costs from soaring and to retain the freedom of Public Ownership.

Thank you for sharing the above mentioned article.

Walter L. Ball,
Consumer

North Abington,
Massachusetts

Snapit-On
Protector Shields for CONDENSER AND BOILER TUBES
DETERS EROSION
PREVENTS MATERIAL WASTAGE
REDUCES MAINTENANCE
GIVES TUBES LONGER LIFE
MADE IN STAINLESS STEEL
AVAILABLE IN ALL SIZES
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CANTON, OHIO
A subsidiary of The Union Metal Manufacturing Company
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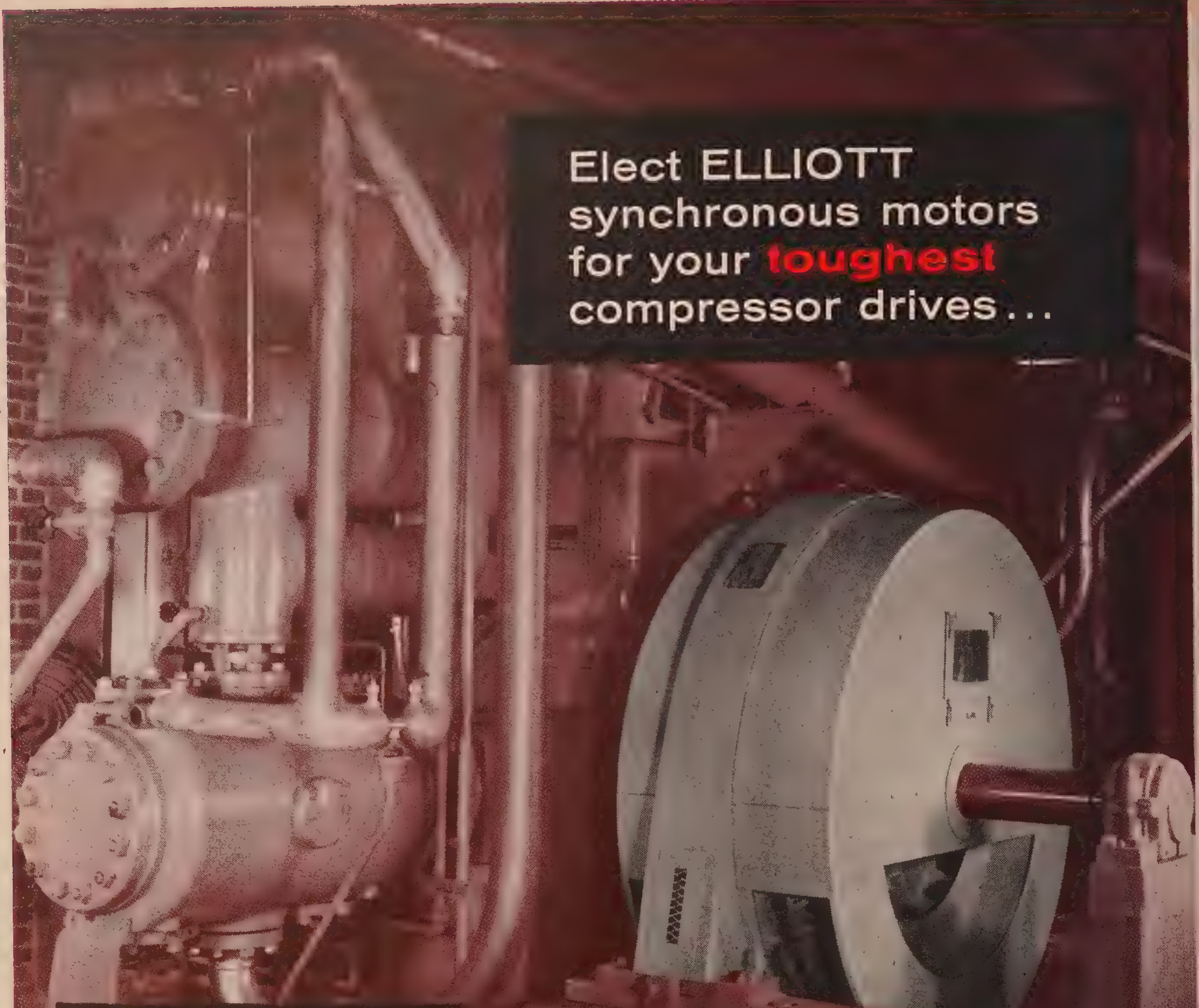

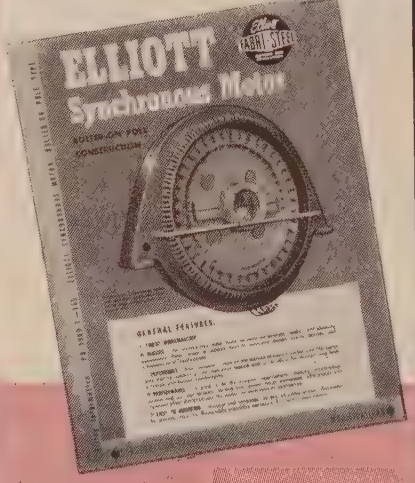
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BUILT-ON POLE CONSTRUCTION
GENERAL FEATURES

Call the Elliott man
at your nearby Elliott District Office
or write Elliott Company,
Ridgway Division, Ridgway, Pa.
Ask for Bulletin PB 5000-2

They're "tailored" to fit your specific application requirements

This Elliott 400-hp, 327-rpm synchronous motor is one of two machines which drives soot blower compressors for a large midwest utility generating station. Here is another example of Elliott-engineered large motors handling "tough" compressor drives *with the greatest economy and long-term, superior performance.*

Two principal reasons for their outstanding performance are the rigid fabricated steel construction, and the high-quality coil insulation. Each coil is hand-wrapped with Mylar-backed mica to withstand severe temperatures and provide long, trouble-free life. What's more, all Elliott synchronous motors are "tailored" *throughout* to meet your exact application requirements.

ELLIOTT Company
Ridgway Division, Ridgway, Pa.

R7-23

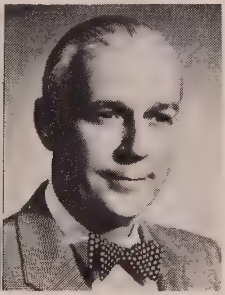
MEN OF POWER

Anaconda Wire and Cable Makes Executive Changes

Allen

Benton

Tindale



Van Valkenburg

David E. Allen, former vice-president-sales, has been elected to the position of executive vice-president of the Anaconda Wire and Cable Co. He succeeds Richard B. Steinmetz, who was elected president of the company last October.

The announcement was made by Mr. Steinmetz.

Other executive appointments include: William H. Benton, former general manager of mills, who has been elected vice-president-manufacturing; John L. Tindale, former commercial vice-president, who has been advanced to the newly created position of vice-president-marketing and sales; and Henry V. Van Valkenburg, former general sales manager, now elevated to the post of vice-president and general sales manager.

Mr. Allen has been with Anaconda Wire and Cable since 1932 and has served in succession of positions leading to his election as executive vice-president. Previous to joining Anaconda, he was with United Gas Improvement Co. and General Cable Corp. He is a graduate of the U. S. Naval Academy.

A graduate of Brown University, Mr. Benton went to work for Anaconda Wire and Cable in 1936, as an hourly worker. He rose through the ranks to become a plant superintendent in 1940, manager in 1951 and general manager of mills in 1958.

Mr. Tindale joined the company as a sales trainee in 1936. He served in several sales offices before becoming a district manager in 1945, products sales manager in 1952, and manager of utility sales in 1954. He was named commercial vice-president in 1959.

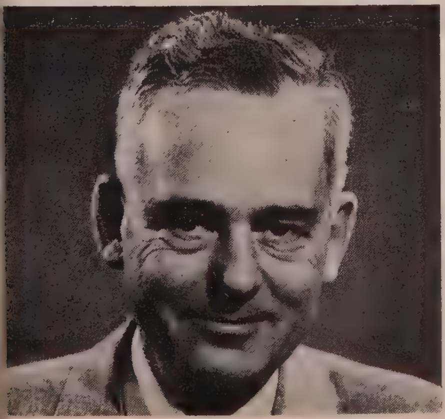
Mr. Van Valkenburg started to work for the company in 1931. He has served in various engineering positions, leading to his appointment as district manager in the Chicago district office in 1948. He was made sales manager for the company in 1955.

Hodges New VP and GM

Richard E. Hodges has been elected vice-president and general manager of the Appalachian Power Co. He succeeds G. L. Furr, who has retired as general manager.

Mr. Hodges joined the Kentucky Power Co. of the American Electric Power System, parent company of Appalachian Power, in 1926. He was named assistant general manager of that company in 1940, rising to general manager in 1943. He moved to the position of a district manager of Appalachian Power in 1948. In 1954 he was transferred to the home office of the company and named assistant general manager.

Mr. Furr, who joined Appalachian Power in 1916, will remain a vice-president and consultant to the company.



G-E Promotes McCune

Francis K. McCune, well-known for his work in atomic energy, has been appointed vice-president-engineering services for the General Electric Co. In his new post, Mr. McCune will be concerned with effective direction of the efforts of the company's engineering resources and some 13,500 engineers.

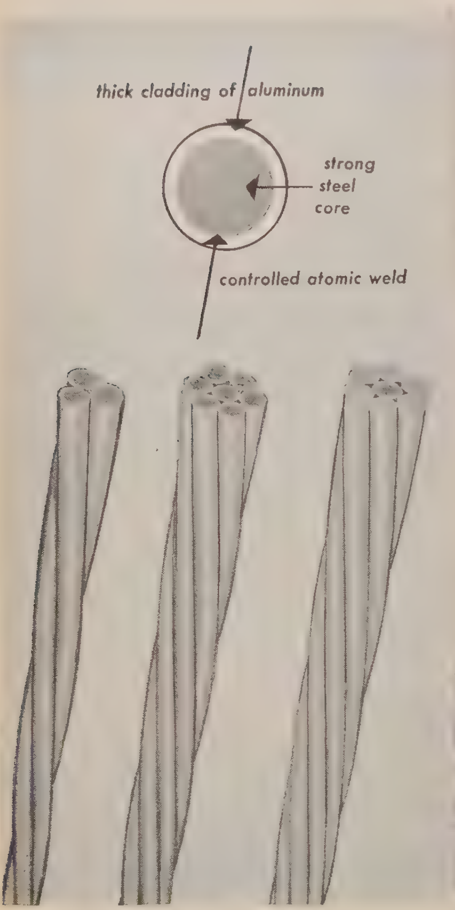
He will be a member of the company's executive office, G-E's senior management body, which is charged with providing long-range planning and guidance for the entire corporation.

Mr. McCune succeeds Clarence H. Linder who was recently named vice-president and group executive for the company's new electric utilities group.

A 32-year veteran with the company, Mr. McCune was formerly vice-president for atomic business development.

The Alumoweld technique of welding aluminum to steel

means TOP PERFORMANCE... LONG LIFE... LOW COST



● You cut costs and assure top performance of your overhead lines when you use Alumoweld for overhead ground wire, guys, messengers, and ACSR core wire ● You'll have no maintenance worries because a thick cladding of pure aluminum permanently protects Alumoweld's high-strength steel core from corrosion. In fact, Alumoweld has the same corrosion resistance as solid aluminum wire—and 33% of the electrical conductivity. Compared to steel, Alumoweld has three times the conductivity . . . is 18% lighter . . . just as strong . . . and will last far longer.

For overhead ground wire, Alumoweld is tops. The high strength-to-weight ratio permits stringing with smaller sags, thus increasing the mid-span clearance. Its excellent conductivity quickly discharges lightning currents to ground—reduces service interruptions.

For guys and messengers, Alumoweld gives long, trouble-free life because it cannot rust. And it's strong and easy to install.

For core wire in ACSR Conductors, Alumoweld eliminates the danger of electrolytic action because it is compatible with solid aluminum wires. It coordinates the life of the strength members with that of the conductor members.

Get all the facts on this low-cost wire and strand by writing today for bulletin E.D. 3000.

ALUMOWELD

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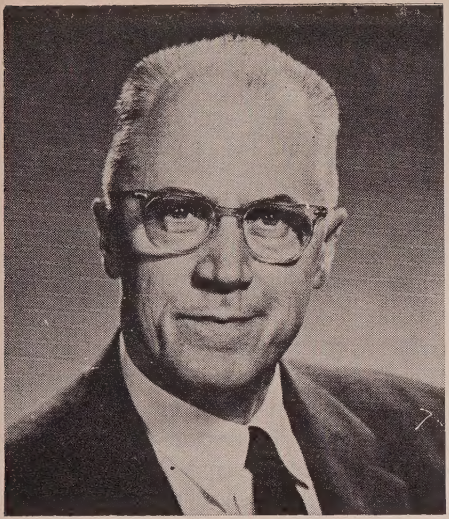
WIRE AND CABLE DIVISION, GLASSPORT, PA.
For Export, COPPERWELD STEEL INTERNATIONAL COMPANY, New York

LeClair To General Atomic



The appointment of Titus LeClair as manager of nuclear power applications for General Dynamics Corporation's General Atomic Division has been announced by Dr. Frederic de Hoffmann, president of General Atomic.

Mr. LeClair moves to General Atomic from Commonwealth Edison Co., where he has been manager of research and development.

Long associated with the electric utility industry in executive engineering positions, Mr. LeClair is a recognized leader in the development of nuclear power for central station generation. He has been an official of the Nuclear Power Group, Inc., which co-sponsored Commonwealth Edison's recently completed Dresden nuclear power plant. He also has served in advisory capacities to the Atomic Energy Commission and the Joint Congressional Committee on Atomic Energy.

A native of Wisconsin and a graduate of the University of Idaho, he has been associated with Commonwealth Edison since 1923.

Copperweld Elects VP

Erling Ringstad, former manager of Copperweld Steel International Co. since its inception in 1944, has been appointed executive vice-president of the export sales organization.

Mr. Ringstad first joined Copperweld in 1936. Prior to that he was with Electric Bond and Share Co. in Argentina and New York, the Duquesne Light Co., the Braden Co. in Chile and Westinghouse.

Harnden Upped

Robert C. Harnden has been named to the newly created post of executive vice-president of Chapman Chemical Co., manufacturer and distributor of wood preservatives and industrial chemicals.

Announcement of the appointment came from Dale Chapman, president. Mr. Harnden has been a vice-president in charge of the company's agricultural chemical division since 1950.

A native of Michigan, Mr. Harnden joined Chapman in 1946 to take charge of research and plant operations. Before that he had been manager of the Dowicide sales division of the Dow Chemical Co.

H. K. Porter, Inc. Announces Changes

At a recent meeting of the board of directors, a number of organizational changes have been made at H. K. Porter, Inc.

James G. Geddes, president of the company for many years, was named chairman of the board. He also continues as treasurer.

Henry K. Porter became the new president while Francis T. Lind was named executive vice-president. Harry M. Webster and Thomas M. Porter were both re-elected vice-presidents.

The only new officer elected by the board was W. E. Northcutt, vice-president.

Men of Power Briefs

H. L. Culbreath, Jr., has been appointed comptroller of the Tampa Electric Co.

Recently appointed chief electrical engineer of Commonwealth Associates, Inc., is **Carl E. Asbury.** He was formerly supervisor of their electrical application section.

Public Service Co. of Indiana has named **W. A. Schulz** chief electrical engineer and **W. L. Montgomery** system planning manager.

E. H. Will, chairman of the board of the Virginia Electric and Power Co., has been selected as one of twelve "outstanding executives" by the Wall Street Journal.

Also from VEPCO: **Thomas S. Martin** has been named manager-system planning, engineering and construction department. He is succeeded as superintendent-system operation, power department, by **Eugene B. Crutchfield.**

Florida Power Corp. has announced four promotions: **D. Frank Shiphorst,** superintendent of transportation; **S. Z. Douglas,** superintendent of the Higgins plant; **George W. Dowsett,** assistant manager of the real estate and tax department; and **James L. Shoemaker,** director of market research.

Joslyn Mfg. and Supply Co. has announced threee xecutive changes: **B. M. Smalley,** executive vice president has retired after 42 years service with the company. At the same time, **Robert F. Dolan,** vice president of the Joslyn Pacific division, has been placed in charge of all production nationally, except wood products and the stainless steel division, with headquarters in Chicago. **Robert H. Gasch,** vice president who has headed up the eastern and southern operations of the company, has been moved to Chicago to be in charge of national sales and marketing, exclusive of the stainless steel division.

E. T. Adams has been appointed manager of Rayescent engineering for the lamp division of Westinghouse Electric Co.

Pennsylvania Transformer Division of McGraw-Edison Co. has announced the appointment of **William I. May** as manager of small transformer sales.

HELP WANTED

GRADUATE ELECTRICAL ENGINEER — Electric Utility in Eastern Massachusetts. Some experience in transmission and distribution desired. Please answer, giving education, experience and salary expected. Write Box M-11, ELECTRIC LIGHT & POWER, 6 No. Michigan Ave., Chicago 2, Ill.

FOR SALE

DIESEL ENGINE—Cooper-Bessemer Model JS-6-D 705 HP @ 514 RPM Continuous Duty Current Model—Never Installed or Operated. New Engine Guarantee—today's price approximately $60,000. Will sell for $30,000.

J. E. Smart
BUCYRUS-ERIE COMPANY
South Milwaukee, Wis.
SO 2-0900

Recent promotions at General Electric include: **Phillip R. Milroy,** manager of engineering, Outdoor Lighting Department; **Hughes W. Ogilvie,** manager-marketing, Medium Steam Turbine, Generator and Gear Department; **John E. Phillips,** manager-Product Development Laboratory, Large Steam Turbine-Generator Department; and **Robert D. Ahles,** manager-manufacturing, Schenectady Foundries.

Vincent S. Boyer is the new superintendent of the Peach Bottom atomic power station of Philadelphia Electric.

Alfred H. Doud is the new director of public relations for Rochester Gas & Electric.

A Comparison Of Two Types . . .

(Continued from page 64)

lem only at the Pelton "skimmer" where it must be brushed from the inclined-plane screen almost daily, necessitating shutdowns for this purpose. It is not difficult to remove from the screen, however, since this is in actuality a perforated stainless-steel plate and cleans easily. The travelling screens at North Fork are automatically self-cleaning and require little attention.

The initial cost of the two structures as installed on these two projects cannot be compared since they differ greatly in reservoir drawdown which is directly proportional to the cost of concrete structures which must be capable of unwatering. In addition, the North Fork artificial outlet is only part of a multi-purpose structure also accommodating upstream migrant adult fish as well as screening the first 1000 c.f.s. of spill. It is necessarily much more involved and expensive than would be the case if it were only built to by-pass downstream migrants. It seems obvious, however, that the North Fork type would be less expensive to build, other things being equal. There are fewer gates and hoists, and the requirements for pumps size are little more than half. Traveling water screens are fairly standard items which are easy to obtain and install.

In summary, the North Fork artificial outlet appears to be not only less costly to build, but is much easier and cheaper to maintain and operate.

The Employee Information . . .

(Continued from page 56)

leaders develop quite rapidly and become very skilled in dealing with a group of people and bringing them to a common viewpoint. This is one of the basic requirements for good managerial performance. The conference leaders are fortunate in being able to learn this skill in the process of preparing for and leading their conferences.

As a result, these conference leaders get promoted. They are selected for ability in the first place. They are then given excellent training in conference leadership. They are then given practice in learning about problems which affect the company and in presenting these problems for discussion by a group of employees. All of this trains the conference leader in one of the essential managerial skills, the process of bringing people to a common understanding.

We have trained 60 conference leaders, which is about 4-percent of our total employee group. A few have been lost by promotion and their places have been filled by newly trained leaders.

The conference leadership training requires five days of concentrated work. The men who take this training are all highly pleased with the result, and so is the company. It teaches these employees the basic skill I have described. These leaders find that they use this skill outside of their jobs as well as in their jobs. Many of these leaders find themselves taking more effective parts in their civic club work, their church work and their other community associations. In this way their influence increases and their value to the company is enlarged. They make a continuing contribution to the improvement of the company's public relations.

Summarizing the benefits, our all-employee conference information program has been an excellent management development activity, it has benefited our employee relations materially and it has contributed substantially to more effective dealing with our public relations problems. And finally, these benefits have been purchased at very reasonable costs.

Look for Hidden Values . . .

(Continued from page 51)

"Here is where we must recognize the need for the closest co-ordination within our own companies in order to bring to bear the soundest of judgment on final purchase decisions. Too often, I fear, technical matters become isolated and treated as such without careful appraisal of the commercial effect.

Mr. Covell also raised the question of "how can the art and science of negotiation be improved . . . how can we contribute our part to a sounder company evaluation of complex decisions as they are made and how can we by our policies and practices assist vendors on whom we depend to serve our industry more effectively."

Care must be exercised in co-ordinating what may appear purely technical discussions with what may turn out to be commercial negotiations. Likewise, final decisions become a matter of judgment—co-ordinated judgment that is—involving many elements which can not be reduced to a precise number of dollars. We must also remember that performance of a contract is not complete until obligations of both parties are carried out.

Mr. Covell then focused attention on distribution costs involved in distribution system equipment—"where well over half of the average utility's capital is invested." He explained:

"Cost in place is what counts—not just the price on the invoice. We would do well to take a realistic look for costs must be paid for somewhere along the line—whether they are those of our own Stores and Delivery Service or those of a manufacturer or jobber. To the extent that a buyer can draw on local stocks economically, it may be well worthwhile, but if those stocks are non-standard or are placed there under the guise of offering good service to only one buyer, a look-see may be called for. Utility buyers and manufacturers as well hardly need to be reminded of the economic facts of diversity of demand, rehandling costs, or cost of working capital," he concluded.

SAG COMPUTATIONS . . .

(Continued from page 68)

ing slide-rule computations is based on the change in Δ_I caused by change in temperature and tension. Let us apply it here to conditions at 60F. Procedure is as follows: Δ_I (determined previously) $= 0.870$ ft

t (temperature increase in conductor length)

$$= CL_u (T_F - T_I) = 9.6 \times 10^{-6} \times 500.118 \times 60 = 0.288$$

Subtotal 1.158

e (shrinkage in conductor length due to reduction in tension)

$$= \frac{(H_F - H_I)\, L_u}{EA}$$

$$= \frac{(1740 - 4000)\,(500.118)}{16 \times 10^6 \times 0.1662} = -0.425$$

$\Delta_{60°}$ .... $= 0.733$

Sag at 60F then equals

$$\sqrt{\frac{3L_s\Delta_{60°}}{8}},$$

but it is simpler to determine $d_{60°}$ by proportion on the slide rule as follows:

Set $d_I = 12.77$ on *C* scale opposite $\Delta_I = 0.870$ on *A* scale. Move hairline of runner to $\Delta_{60°} = 0.733$ and find $d_{60°} = 11.72$ ft on *C* scale which checks the 1.72 ft previously determined.

Sometimes it is desirable to complete the graphic solution as shown in Fig. 2. The curves can be plotted directly from slide-rule readings. If greater accuracy is desired, a calculating machine is used.

A slight simplification of this general procedure makes it possible to determine with little loss in accuracy values for any span or temperature by simple proportion given one set of conditions. Assume that

$$Y = \frac{8AE}{3L_s^2} = 28.364 \text{ instead of}$$

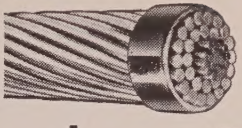
$$\frac{8AE}{3L_sL_u} = 28.358$$

Then, if values of $\frac{8AE}{3L_s^2}$ for, say, $L_s = 500$ ft and of CAE $(T_F - T_I)$ for, say, $(T_F - T_I) = 60$F are added to ones conductor reference table, values for other spans or temperatures can be taken off the slide rule by simple proportion as follows:

$$\frac{\text{A Scale}}{\text{C Scale}} = \frac{28.36}{400} = \frac{Y_{400}}{500},$$

and $Y_{400} = 44.3$.

ACCO *Aluminized* CORE WIRE

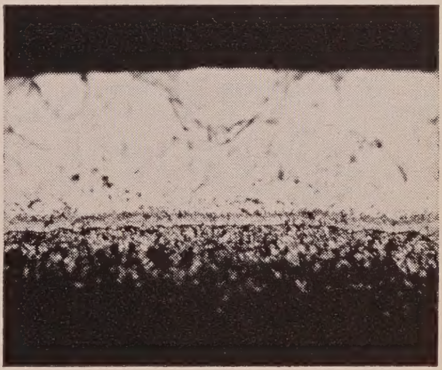


Outlasts Galvanized at least 2:1 !

Page ACCO *Aluminized* core wire for ACSR provides all the strength of steel plus the corrosion-resistance of aluminum. An adherent, ductile coating of aluminum is applied by Page's patented hot dip method. Salt spray testing conducted according to ASTM procedures proves that ACCO *Aluminized* wire should last *at least twice as long as galvanized.*

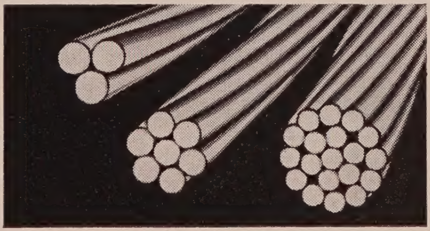
It is available from leading manufacturers of ACSR who have recognized the advantages of stranding aluminum conductor wires over an aluminized steel core—eliminating the "third metal" (zinc) in the completed conductor cable. Aluminized steel core wire assures longer life for your ACSR in both marine and industrial atmospheres.

Next time you order conductor cable, specify ACCO *Aluminized* core wire—it gives more reliability per dollar than any other core wire available.

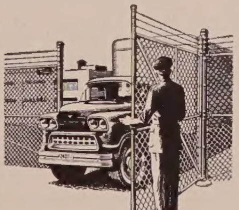


500X magnification at right shows thin aluminum-iron alloy resulting from diffusion of the two metals, and the outer layer of aluminum in the form of a fine-grain cast structure.

OTHER ACCO *Aluminized* STEEL WIRES



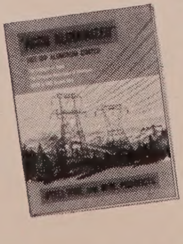
ACCO *Aluminized* steel strand is available with 3, 7 and 19-wire construction for guy, ground and messenger wire applications. Offered in Common, Siemens-Martin, High Strength, Extra High Strength, Utility grades.



Page chain link fence of ACCO *Aluminized* wire provides attractive, economical and longer-lasting protection.

Tie wire, telephone and telegraph wire, barbed wire and other products also are available in Page ACCO *Aluminized* wire. Ask us for details.

WRITE FOR DETAILS . . .



Booklet DH-537 explains the manufacture, properties and uses of Page ACCO *Aluminized* steel wire. Write us at Monessen, Pa., for your copy.

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ACCO

Page Steel and Wire Division
American Chain & Cable Company, Inc.
Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore. San Francisco, Bridgeport, Conn.

PAGE —*the source for answers to wire problems*

CALENDAR OF EVENTS

March 6-9—American Society of Mechanical Engineers, Fifth Gas Turbine Conference, Hotel Rice, Houston, Tex.

March 14-18—National Association of Corrosion Engineers, 16th Annual Conference and 1960 Corrosion Show, Dallas, Tex.

March 21-23—Southeastern Electric Exchange, Annual Conference, Boca Raton Hotel, Boca Raton, Fla.

March 21-23—National Electrical Manufacturers Association, First National Electric House Heating Exposition, Hotel Sherman, Chicago, Ill.

March 24-25—Oklahoma Utilities Association, Annual Convention, Oklahoma Biltmore Hotel, Oklahoma City, Okla.

March 27-29—Southwest Electric Conference, Chandler, Ariz.

March 28-29—Pacific Coast Electric Association, Engineering and Operation Conference, San Francisco, Cal.

March 29-31—22nd Annual American Power Conference, Hotel Sherman, Chicago, Ill.

April 3-8—Engineers Joint Council, Nuclear Congress, Coliseum, New York, N. Y.

April 7-8—Southeastern Electric Exchange, Engineering and Operation Section Conference, Roosevelt Hotel, New Orleans, La.

April 11-13—A. and M. College of Texas, Thirteenth Annual Conference for Protective Relay Engineers, College Station, Tex.

April 20-22—Missouri Valley Electric Association, Engineering Conference, President Hotel, Kansas City, Mo.

April 27-29—Northwest Electric Light and Power Association, Engineering Conference, Hotel Florence, Missoula, Mont.

April 28-29—Pennsylvania Electric Association, Systems Operation Committee, Bedford Springs Hotel, Bedford, Pa.

May 2-4—Edison Electric Institute, Purchasing and Stores Committee, Annual Meeting, The Warwick, Philadelphia, Pa.

May 12-13—Public Utilities Advertising Association, Annual Convention, Waldorf Astoria Hotel, New York, N. Y.

May 16-18—Pacific Coast Electrical Association, Annual Convention, Stardust Hotel, Las Vegas, Nev.

May 23-25 — Northwest Electric Light and Power Association, Business Development Conference, Chinook Hotel, Yakima, Wash.

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